FEBRUARY, 1961

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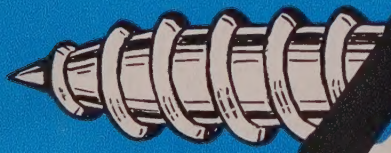

MAR 1 1961

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IN THIS ISSUE:

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How to Specify and Use Threaded Fasteners

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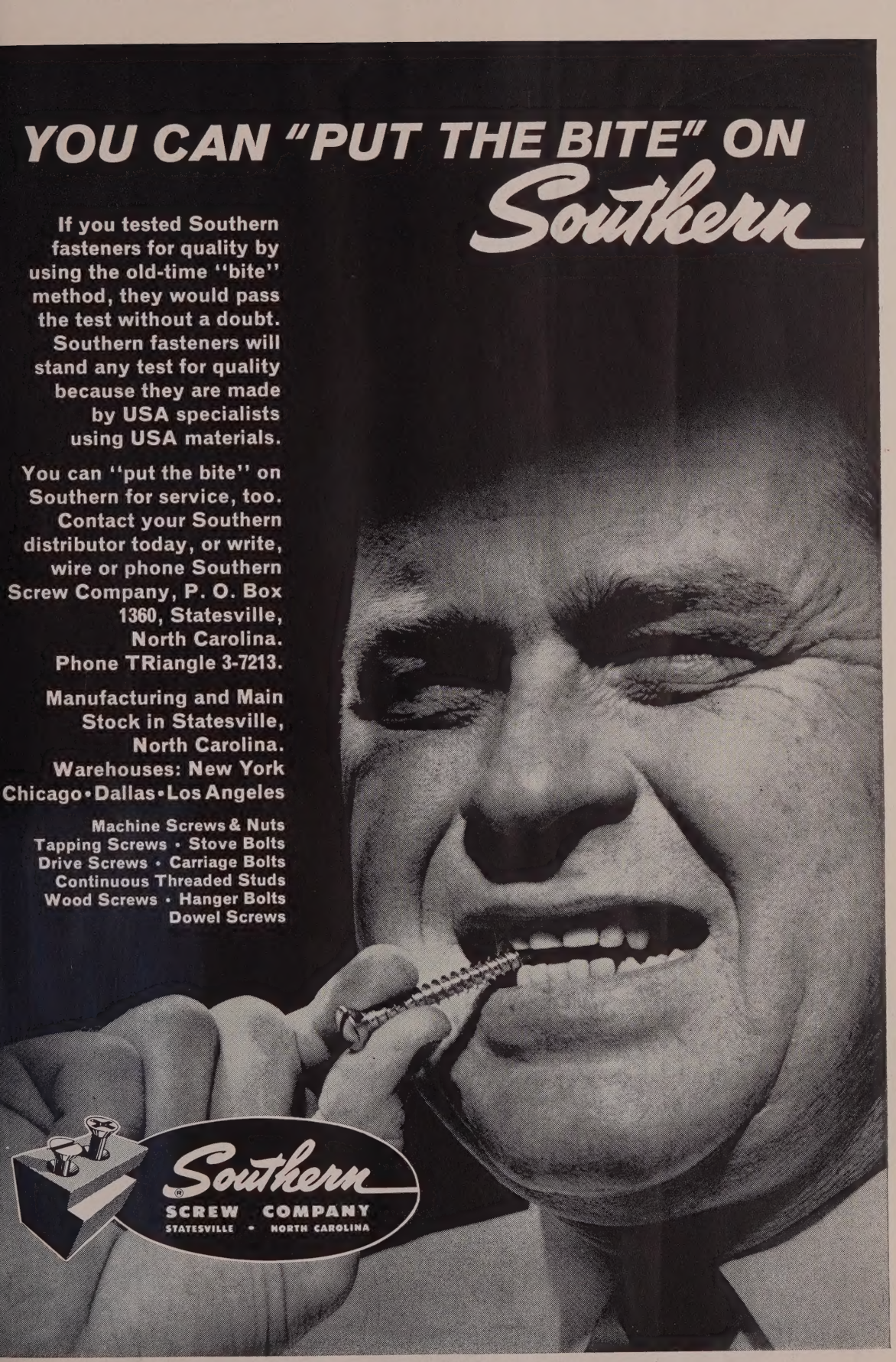

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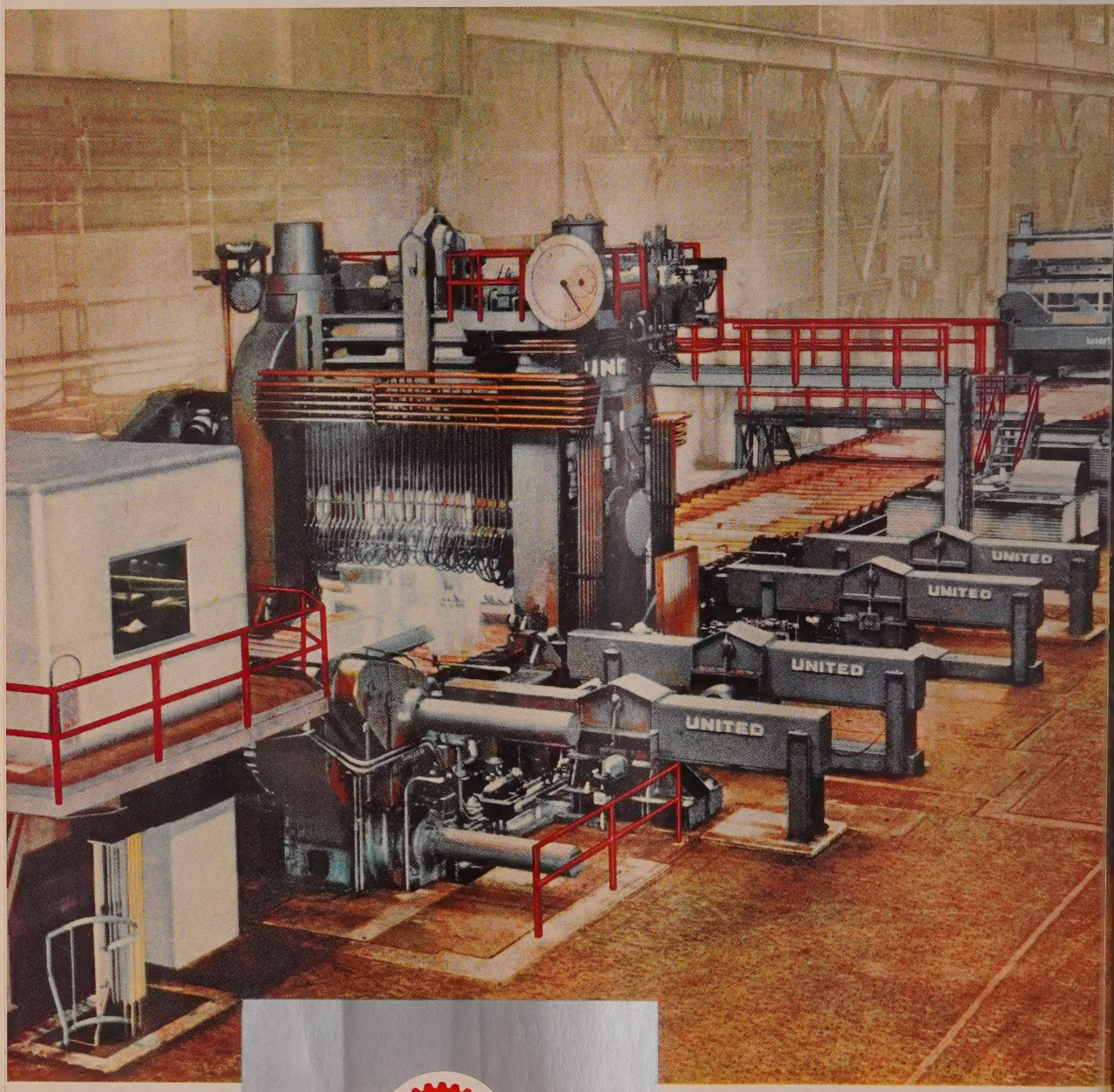

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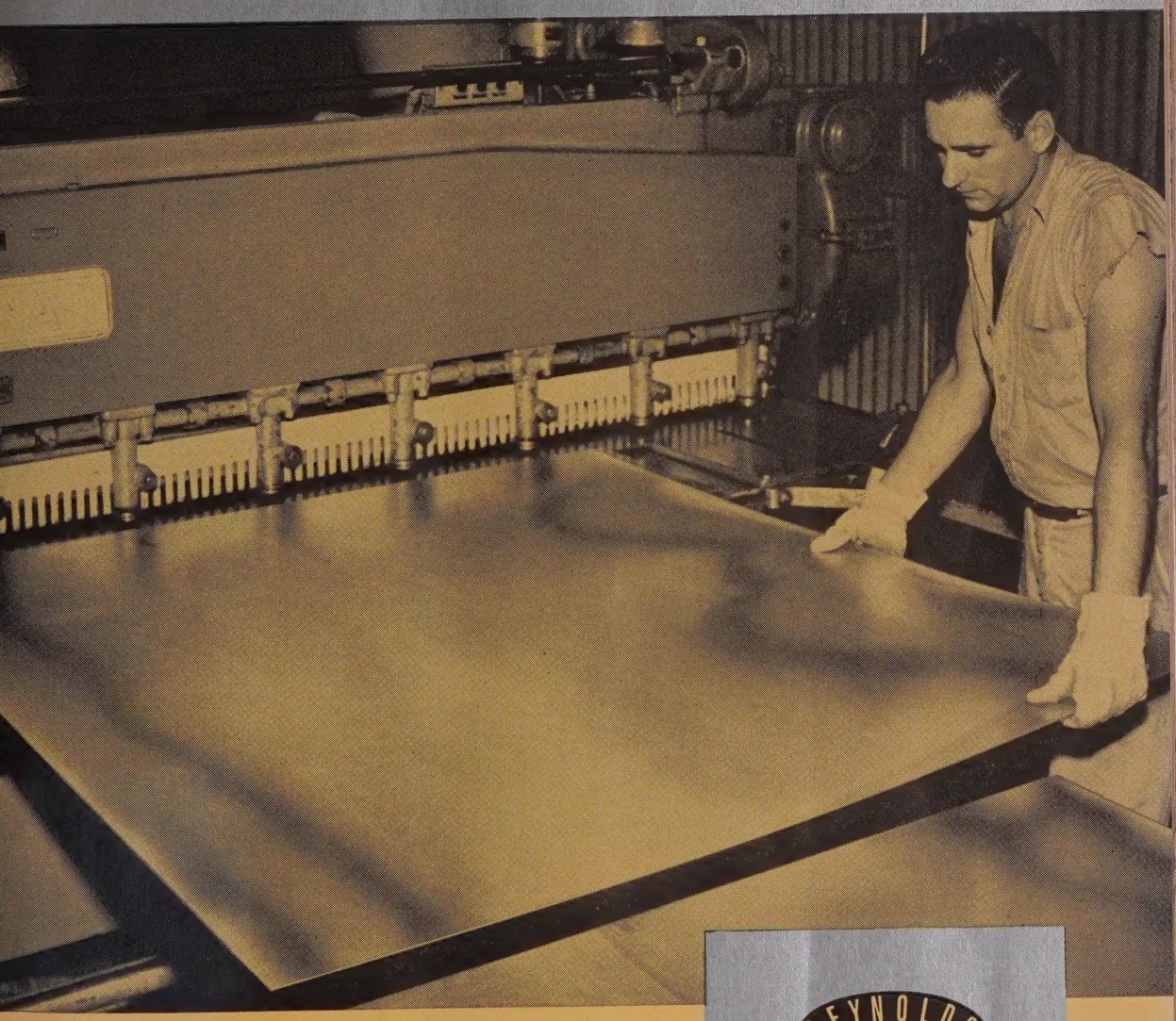

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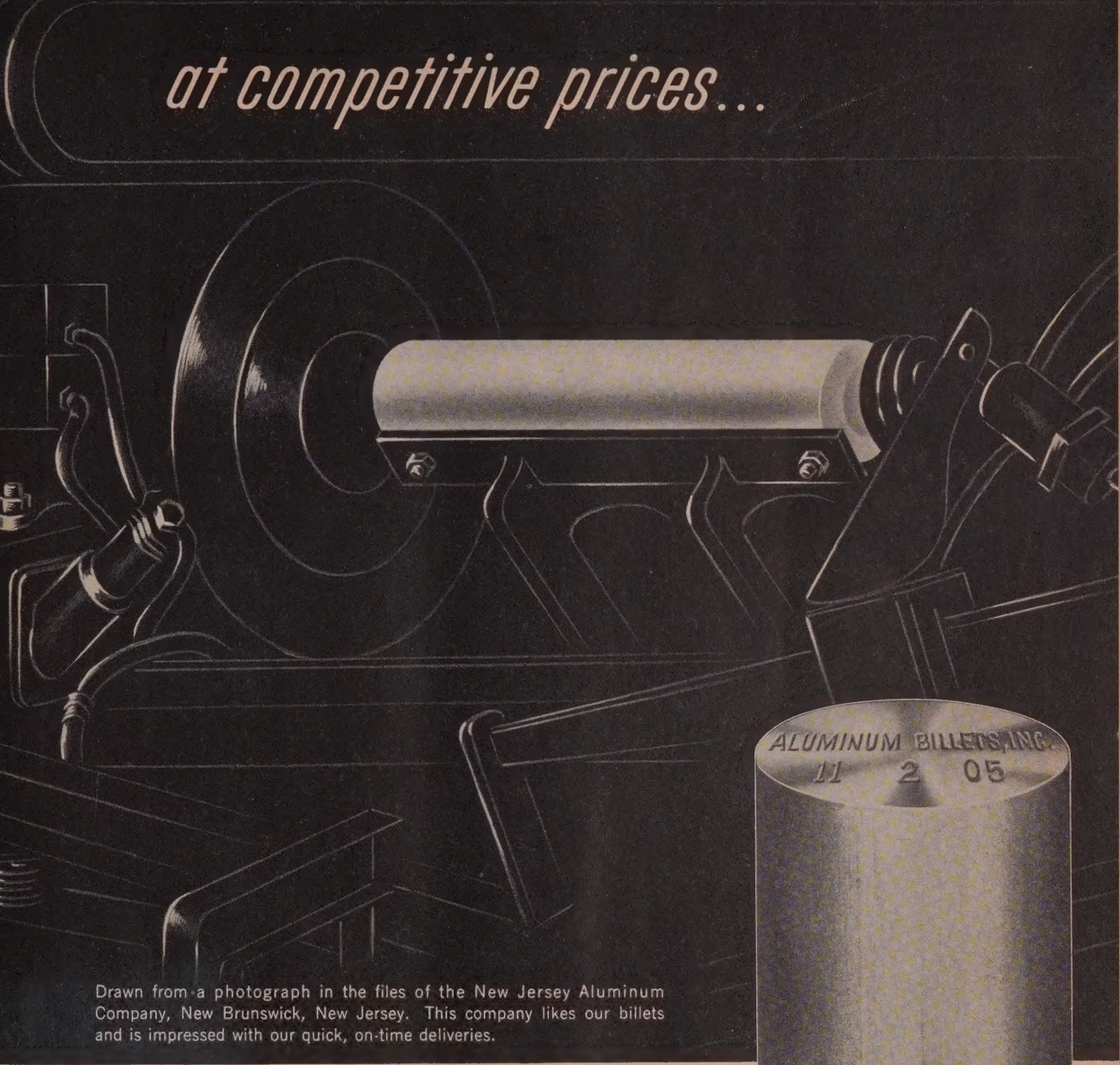

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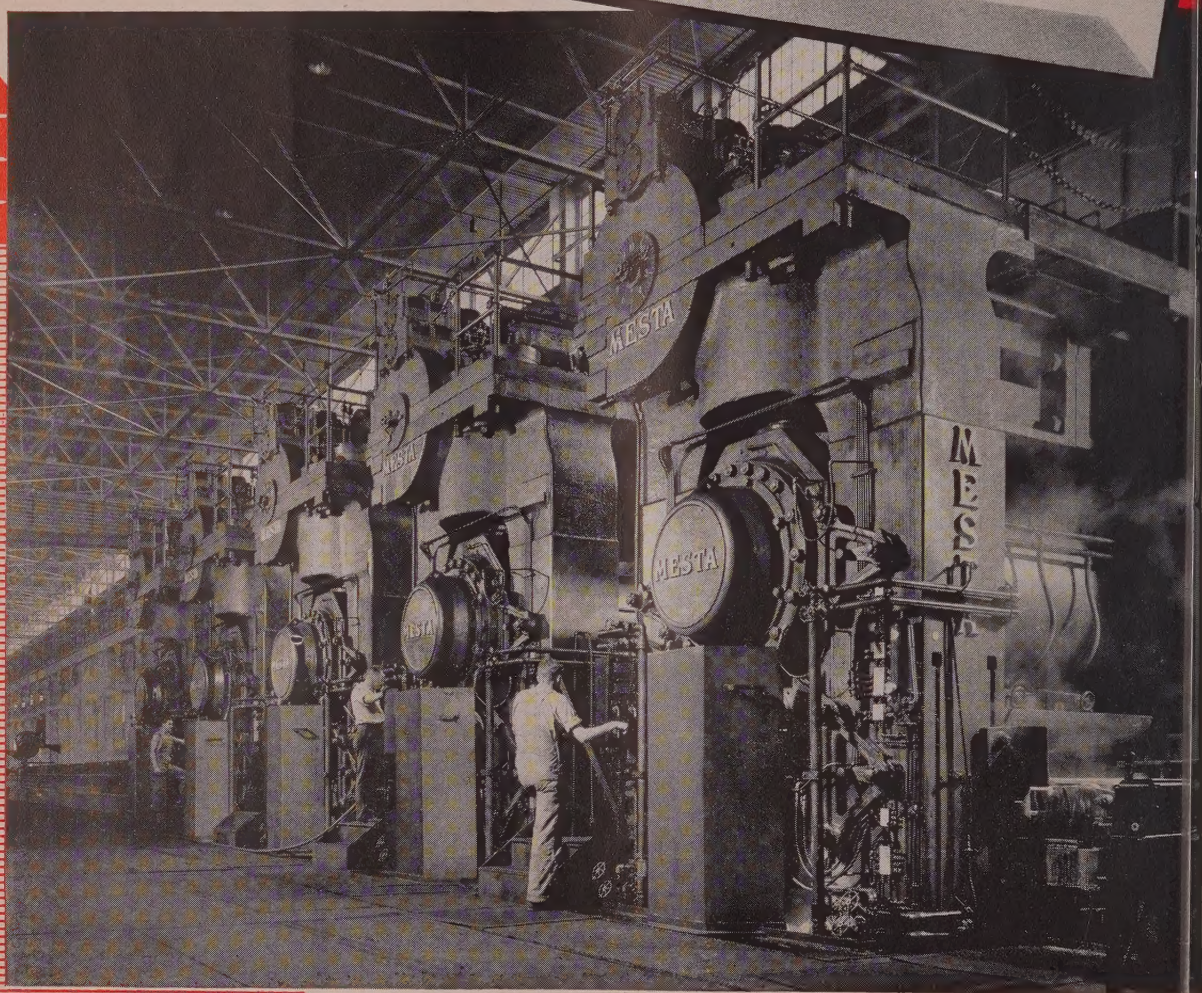

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Read in companies that produce, fabricate and cast aluminum, magnesium and titanium, and firms that use these metals in manufacturing end products.

THE COVER: Our recent "fastener" ey of typical aluminum product manurers revealed, among other things, a for more data on fastening methods aluminum (see MM, Jan. '61, P. 28). help satisfy this need, we are publishing part report on Fastening Aluminum. 2, in this issue, covers permanent fasng—riveting and stitching. Next month, 3 will deal with threaded fasteners — s, bolts, nuts, etc. The series will be luded with a report on special fasteners.

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Modern Metals

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Letters

Sonic Energy For Die Castings

Sirs:

I noted with interest the abstract regarding sonic energy applications to die casting on page 60 of the December issue of Modern Metals.

I would appreciate it very much if you would put me in contact with the authors since my firm is very interested in getting detailed information on this new process.

"H"—Connecticut

MM—For details write Southern Die Casting & Engineering, 206 Albertson Rd., High Point, N. C.

Die Casting Exposition Reports

Sirs:

Read the article in the December issue with regard to the Die Casting Exposition held recently in Detroit, and regret that I did not attend. It must have had a wealth of information available.

Our company, within the last four years, set up to die cast its own parts and, of course, has much to learn and many problems to overcome.

At this late date, how would one go about getting copies of the various papers distributed at the technical congress, especially those dealing with all phases of aluminum and zinc die casting?

With your description of the Exposition, I look forward to the announcement of a second gathering of die casters so that I may get in an early reservation.

"G"—Massachusetts

MM—We're not sure that all the papers were reprinted, but write to Hall Industrial Publicity, 23716 Woodward Ave., Pleasant Ridge, Mich. This firm handled the details, and they may be able to help you.

Needs Die Caster for Bowls

Sirs:

We thought you might be of some help to us in locating a manufacturer of aluminum die castings.

We have a round 23" diameter aluminum bowl which is used for barbecues. We are interested in locating a manufacturer who is able to manufacture this item and give us quotations on same.

We would appreciate your listing the manufacturers and we would certainly tell them that we got this information from Modern Metals. . . .

"M"—Pennsylvania

MM—We have sent you names of several die casters who are equipped to make and finish aluminum barbeque bowls.

Wants to Merge Or . . .

Sirs:

Reference your January issue, "Looking Ahead." You say a number of firms are on the lookout for good situations in aluminum. While we are quite small with an investment of only about $25,000, we do have an excellent plant, facilities and location.

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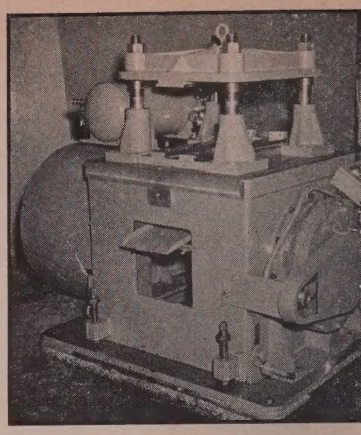

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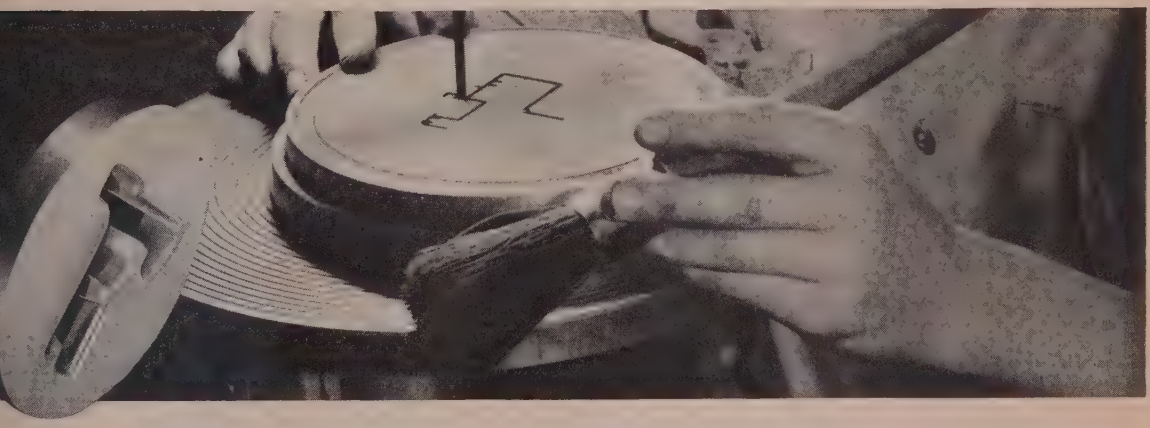

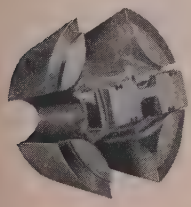

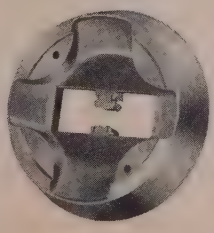

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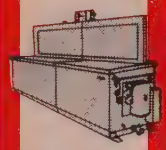

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firm that can give us items to manufacture in quantity. We have ample skilled labor at reasonable prices.

If you can give us the names of a few firms that may be interested in working with us, we will be very grateful.

We also install aluminum siding. Your January issue covered the siding field well and we enjoyed the issue very much. We did not know that siding is now being used to such an important extent. We are going to shape our plans to do more business in siding.

"G"—South Carolina

MM—We correctly stated that many firms are today buying smaller firms who, if given some help, look as if they can get somewhere. We've received several letters like the one above, asking how to get in touch with a big brother with money. One growing California firm said all it wanted was stock for its assets to keep away from a big inheritance tax in case of death. We also heard from others who are just plain scared and want to get out.

There are plenty of firms in the bigger cities who do nothing but arrange merger situations. Generally speaking, the good ones usually have several clients who are anxious to buy companies with a future. However, before dealing with these brokers, screen them carefully, find out what they expect for performing the marriage, and get it in writing.

A firm can advertise the fact that it will entertain the merger idea. You might be amazed at the response that would result.

If any reader wants to get in touch with Mr. "G," we'll gladly forward the correspondence.

Fastening Aluminum

Sirs:

Your part 1 of the series on Fastening Aluminum was exceptionally well done. It is plain that you have dug deep for the information. . . .

If you plan to reprint the series, put us down for six copies.

"J"—Michigan

MM—We do plan to reprint the series. Copies will be available at $1.00 each, after it's completed in April.

Part 2, in this issue, deals with riveting and stitching. Part 3 will deal with threaded fasteners. If you want to order in advance, fill in the coupon on page 46.

Aluminum Chain Link Fence

Sirs:

Thank you for your excellent story on chain link fence. The reaction has been phenomenal. I have received over thirty inquiries, 50% of which have come from the chain link fence field. . . .

Another rather strange side to this is that the applicators of aluminum siding seem to be showing a great deal of interest. I wonder what they have in the back of their minds. . . .

"J"—Iowa

Sirs:

I am interested in securing reprints of an article appearing in the December 1960 issue. It is entitled "Chain Link Fence, A Fast Breaking Market." Would you give me the cost of the reprints if they are available.

"E"—Missouri

MM—It appears that aluminum is moving in on galvanized for chain link fences, and that the potential market is showing great growth. It will doubtless gain in momentum as the new group in Washington pushes the modernization and rebuilding program soon to get underway.

Reprints have been made of the article, and copies have been sent.

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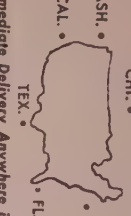

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A most unusual opportunity for a competant technical man, thoroughly experienced in the complete operation of vertical stud Soderberg anode cells. The man selected must have an outstanding engineering record, a theoretical knowledge of this electro-chemical process, and extensive operational experience producing primary aluminum. Must be capable of quality inspection of actual operations. Excellent salary, major benefits. Detail your background and experience in strict confidence.

HARVEY ALUMINUM
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Use the latest in welding advances and techniques? For Modern Metals' 54-page reprint on the subject see page 71.

FOR SALE

6 Aluminum Tube Mills

4" - 12" dia., .042 to ⅛" thick
ALL NEW 1954-1958

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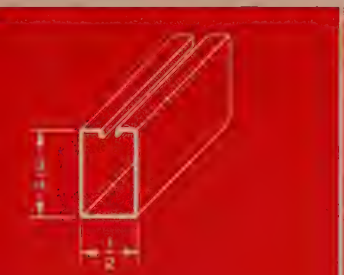


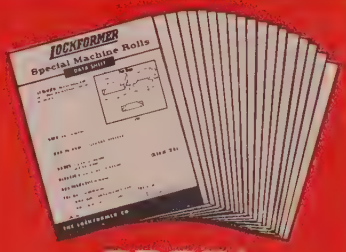
ART: Window pane channel section.
MATERIAL: .025" aluminum.
STOCK WIDTH: 2¼".
PEED: 60-65 fpm.

PART: Fluorescent lighting fixture trim.
MATERIAL: 18 gauge CRS
STOCK WIDTH: 2½" – run in pre-cut lengths.
SPEED: 40-45 fpm.

PART: Door or curtainwall track slide
MATERIAL: 22 gauge CRS
STOCK WIDTH Developed 2¾"
SPEED: 45 fpm.

ART: Door or window weatherstrip.
MATERIAL: .020" aluminum.
TOCK WIDTH: 1½".
PEED: 65 fpm.

PART: Toy and appliance handles
MATERIAL: .025" CRS and pre-coated aluminum.
STOCK WIDTH: 1¹¹⁄₁₆".
SPEED: 45-60 fpm.



FREE!

Complete set of current roll forming data sheets include all details on a variety of parts for use Lockformer jobs running now ... at big savings.

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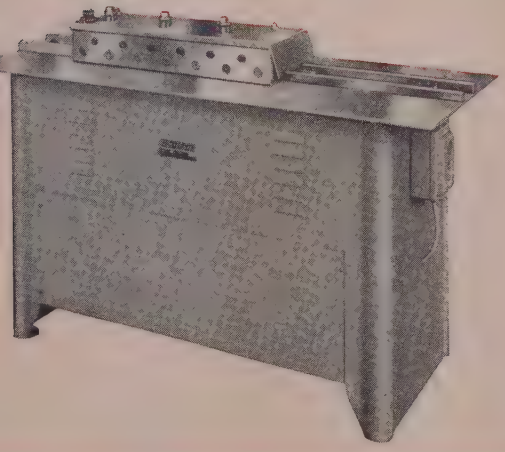

1. COMPLEX CONTOURS IN ONE OPERATION.

2. PRODUCTION RATES NO OTHER FORMING METHOD COULD EQUAL (these parts being formed at speeds from 40 to 65 fpm).

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5. VERY SMALL INVESTMENT. (Machine and custom rolls to produce above parts range from only $1,710 to $1,990—*complete!* No high development costs—Lockformer special rolls are simply added to a standard mass-produced chassis.)

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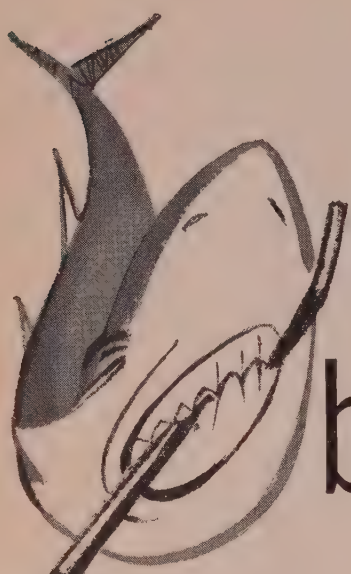
TIME SAVING, MONEY MAKING EQUIPMENT

the saws* with the big bite



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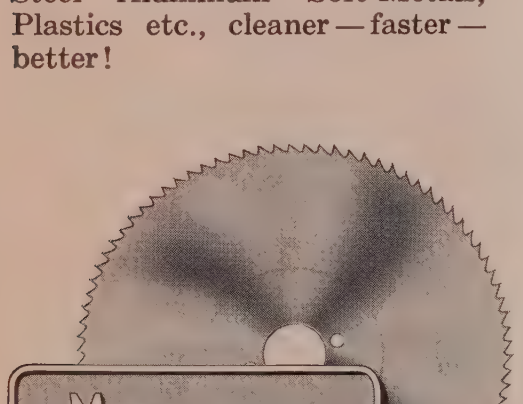
On all circular saw blades to cut Steel—Aluminum—Soft Metals, Plastics etc., cleaner—faster—better!



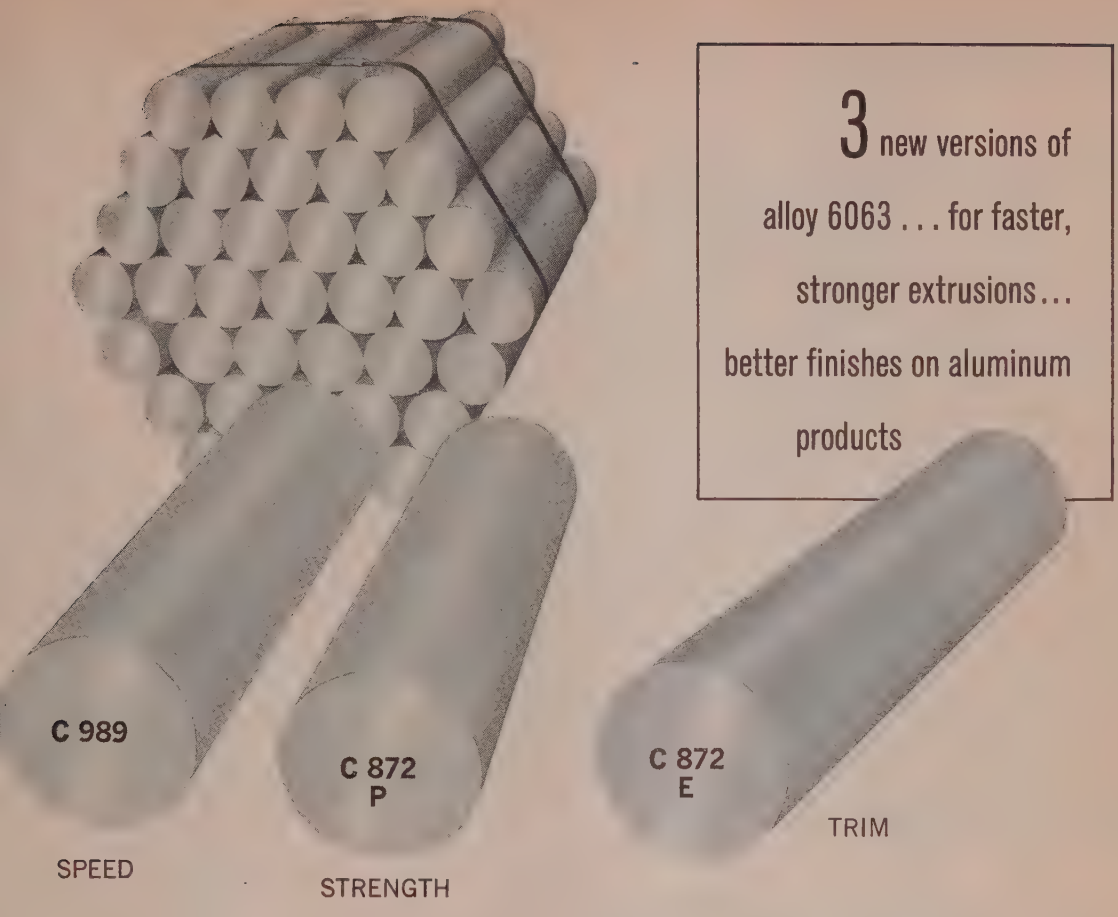
1221 East 222nd, Cleveland 17, Ohio
National Distribution and Service

Here and There

Watch Out for Delrin « « Although our co ments about Delrin in this department last ye struck a grim note, they turn out not to have bee unduly pessimistic. Hardly more than a year old, D Pont's new plastic product has rung the bell in mo than 500 applications—from automotive parts to pac aging—and has worldwide distribution. Now the pri has been cut from 80 cents to 65 cents a pound, a if the men charged with finding new uses for aluminu seem distraught as they see Delrin invade one alum num market after the other, it's possible they wi feel worse later on. DuPont says that of the 500 er products where Delrin has found use, 82% of its to nage was used to replace metals. Of this quantity 33 replaced steel; 15% replaced zinc die castings (Delr is already cheaper than zinc on a volume basis); 19 replaced aluminum. Delrin is still costlier than alum num, but this doesn't seem like much to cheer abou new price reductions will doubtless come as productio techniques are refined and the volume of consum tion grows. DuPont says its product is a new conce in thermoplastic engineering materials which offers combination of properties that bridges the gap betwe metals and plastics. Delrin can be worked, and p forms, like metal; yet forming and finishing operatio are much cheaper than for other materials—decided cheaper than finishing operations on aluminum. Loo like the U.S. primary producers had better duplica Aluminium Limited's achievement in reduced produ tion cost: they're going to need all the margin th can get. Read on.

More Thin Tin « « Last fall U. S. Steel announce a new product designed to discourage canners fro switching to aluminum. The product was Ferrolit which weighs half as much as conventional tinpla (aluminum is much lighter than Ferrolite), and whi costs from $2.45 to $3 less. Now, other steel produce have joined the fight. Jones & Laughlin has alrea shipped some lighter metal to oil can makers, and t Yorkville, Ohio, works of Wheeling Steel Corp. wi begin rolling thin tin in March or April. Granite Ci Steel Co. will also roll some lighter tin this sprin and other companies—National Steel Corp. and Young town Sheet & Tube Co.—will probably do the sam soon. Aluminum may be hard-pressed to retain its to hold in this business.

Danger; Ductile Iron « « There's some justific tion for the rosy hue that pervades most forecasts aluminum consumption by the auto industry. Th per-car average is reliably estimated to have jump 14% to 62.1 pounds in the 1961 models. (But laggi sales have forced auto makers to lay off workers an cut back production, so actual aluminum consumptio by the industry could prove disappointing.) Engi blocks have accounted for much of aluminum's rece gain; undoubtedly figure prominently in the predi tion that per-car use of aluminum will reach 250 poun within ten years, boosting aluminum usage by the i



3 new versions of alloy 6063 . . . for faster, stronger extrusions . . . better finishes on aluminum products

Now you can pick the type of ALCOA EXTRUSION INGOT that works best for you!

other "Alcoa first"—Alcoa announces *three* distinct versions of 6063, the long-accepted standard the industry: **C989 Homogenized, C872 P mogenized, C872 E Homogenized.** You select type designed to match your product and production requirements, whether you need . . . **STER EXTRUDING**—Mainly concerned with eed? Then C989 Homogenized is for you. For n-wall, hollow sections and solids, this alumin alloy can be extruded 25 to 50 per cent ter than standard 6063 alloy . . . with as good a sh or better! **STRONGER EXTRUSIONS**—Need uctural solids with good tensile strength, yield strength, hardness and a tough finish? Choose C872 P Homogenized. **TRIM EXTRUSIONS**—Trim sections needed, with minimum physical property requirements? For desk trim, electrical appliances, similar applications where finish and long die life are of primary concern, select C872 E Homogenized. For more information on extrusion alloys that will help lower your costs and *improve* your product, call your nearest Alcoa sales office. Or write: Aluminum Company of America, 860-B Alcoa Building, Pittsburgh 19, Pa. World-wide sales through Alcoa International, Inc., 230 Park Avenue, New York 17, N. Y.

Alcoa Aluminum Ingot is refined, clean, pure, sound, uniform, customized

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A PROMPT DEPENDABLE MILL SOURCE
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5,000 STANDARD SHAPES WITHOUT DIE CHARGE—prompt mill-run service on a wide variety of shapes.
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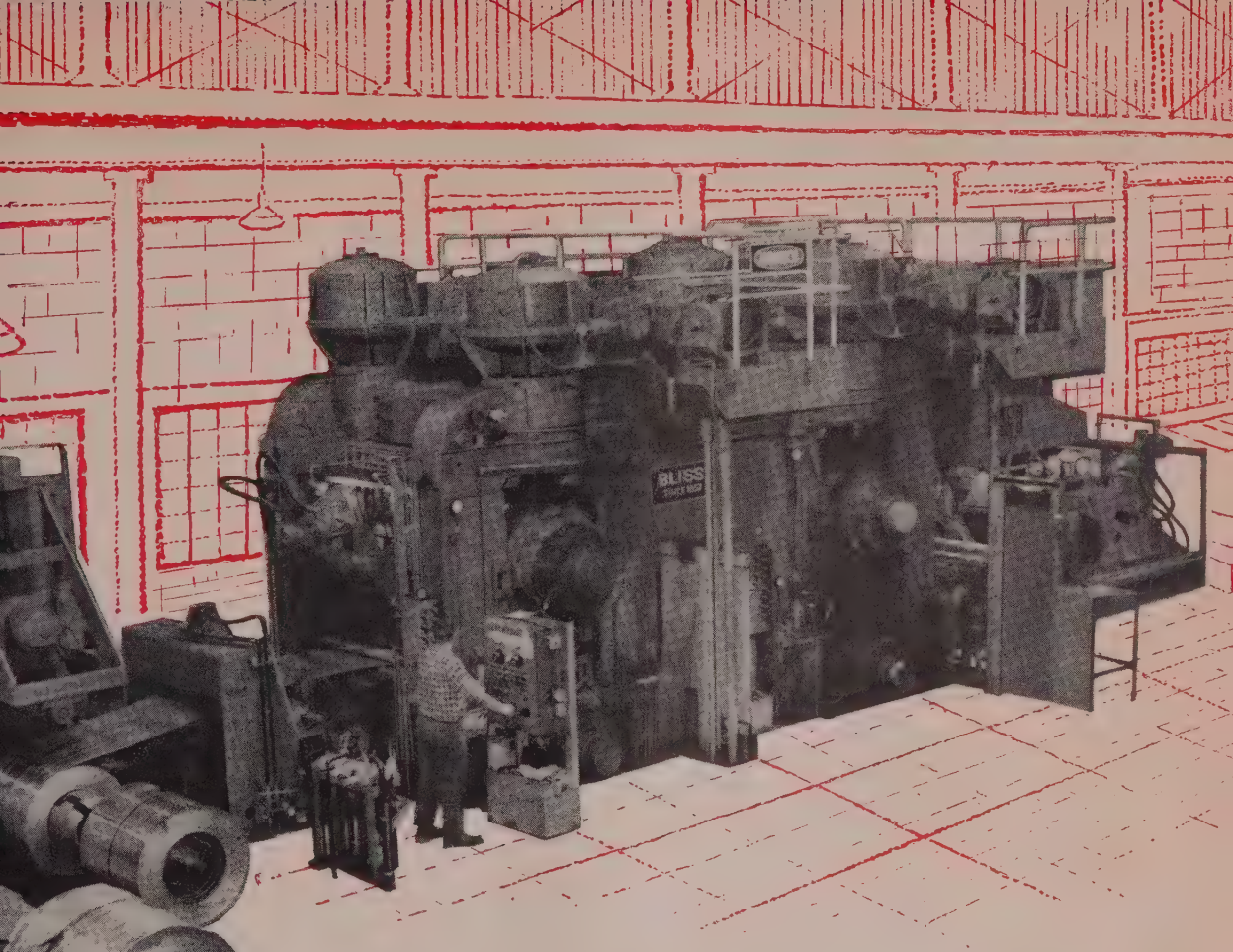
dustry to 750,000 tons annually. But don't take it fo granted; other materials are very much in the pictu Example: The Ductile Iron Society reports that a auto makers are experimenting with their materi as a replacement for not only cast iron, but also alum num. A ductile iron engine block would cost half a much as an aluminum unit, according to the Societ and it would weigh 30% less than gray iron. Ma engine parts are already made of ductile iron, an some auto makers are said to be playing with a com bination wheel and brake drum which would be ca in a single piece. Caterpillar Tractor uses ductile iro in some of its engines; other truck builders are said t be interested. It's reported that Ford will have a ductil iron engine in production by 1962. So the battle rag on, and the outcome is far from clear.

Formidable Fence Market « « As in the case o cans and conduit, the galvanized steel industry wi try to parry aluminum's recent thrust at the chain lin fence market. But recent developments seem to favo aluminum in this sizable business. Example: The U.S Navy Bureau of Yards and Docks recently issued a fed eral specification on aluminum chain link fencing. Th spec—MIL-F-22709 (DOCKS)—applies to all federal pro curement agencies, both military and civilian. To gether, these agencies comprise the biggest buyers o chain link fencing, according to John O'Donnell, A coa's manager of highway product sales. "Aluminu chain link fence fabric is superior to that previousl used because of improvements in tensile strength," O'Donnell asserted. "It is now available in all 5 states and while it commands a small premium ove other types . . . the extra costs are quickly offset in maintenance." It's a big market—one that uses up t 500,000 tons of steel annually. As we speculated in our cover story two months ago, chain link fencin could consume at least 25,000 tons of aluminum i 1961; perhaps 130,000 tons by '65 (see MM, Decembe '60, p. 28). As a result of that article, one supplier o aluminum fence fabric received over 30 inquiries half of them from the chain link fence field, and several from aluminum siding applicators. Here's on bright spot for aluminum.

Supersonic Snafu? « « In mid-'60, rumors claimed Russia was building an aluminum supersonic transpor plane. At that time, Boeing Airplane Co. was urgin the U. S. government to help private industry financ development of similar craft. Reports on supersoni transports then stopped—until recently when R. J. Patton of Convair stated flatly that existing data o aluminum aircraft is so spotty that a Mach 2 plan couldn't be designed and built. Specifically Patton point ed to lack of information on the performance of alu minum alloys after being exposed to 300° to 350°F fo more than 10,000 hours. This is serious since the life expectancy of a transport is 30,000 hours. Because o inadequate information on aluminum, plane companies are reportedly skipping to Mach 3 designs in steel. In formation on steel is more solid, though some voids do exist, according to Patton. He also charged that long term data on titanium (the alternate metal for Mach 3 planes) is almost non-existent.



New Bliss mill doubles Quaker State Metals' cold rolling capacity

With a rolling capacity now approaching 10 million pounds a month, Quaker State Metals Company of Lancaster, Pa., division of Howe Sound Co., ranks as one of the largest independent rollers of aluminum in the United States.

A new Bliss tandem mill is a key unit in Quaker State's recently completed expansion program. In production a week after its erection was completed, the mill has more than doubled the plant's cold rolling capacity.

It reduces strip from .250 inch to .062 inch in a single pass. Delivery speed is 1500 fpm. Coil handling is completely mechanized, utilizing a coil opener equipped with a peeler knife and an automatic guide control.

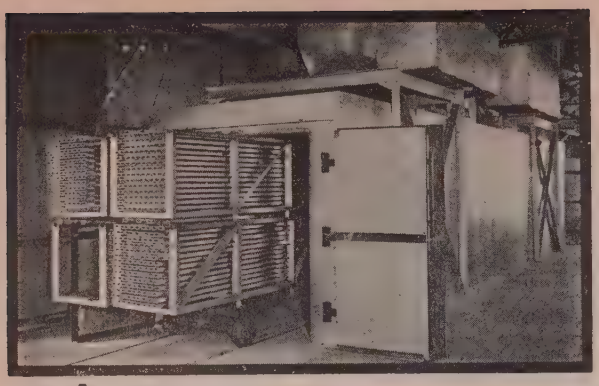
Whether your own plans call for the addition or modernization of a single unit or a complete rolling plant, you'll find that the Bliss Rolling Mill Division can help you with the problems you may encounter. For examples of Bliss installations for rolling both ferrous and non-ferrous materials, write for our 84-page Bulletin 40-B.

BLISS SINCE 1837

Bliss is more than a name . . . it's a guarantee

E. W. BLISS COMPANY, Rolling Mill Division, Salem, Ohio

Subsidiary: The Matteson Equipment Company, Inc., Poland, Ohio



carl mayer Designs and Builds
Better ALUMINUM Extrusion
AGEING OVENS

This truck type oven is now in service at Penn Extrusion Corporation, Erie, Pa. Close temperature control is maintained through the use of two gas fired, recirculating air heating systems. Other Carl Mayer design features assure trouble-free, economical operation. Write for Bulletin HT-53.

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20800 CENTER RIDGE ROAD, CLEVELAND 16, OHIO
OTHER PRODUCTS: Core & Mold Ovens • Rod Bakers • Paint and Ceramic Drying Ovens • Special Processing Equipment & Accessories

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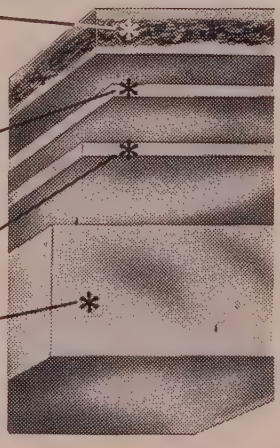
BORAL PLATE Boron-carbide suspended in aluminum and clad with pure aluminum. For shielding against neutron passage. Available in a wide range of sizes and B_4C content.

HK31 AND HM21 SHEET AND PLATE Magnesium-thorium alloys for elevated temperature applications such as missiles and high-speed aircraft.

AZ31 SHEET AND PLATE The most widely used Magnesium alloy for service conditions where temperatures do not exceed 300°F.

TOOLING PLATE Combines light weight, low cost with free machining, close flatness tolerances, dimensional stability, excellent weldability, good stiffness and strength, high damping capacity and freedom from porosity.



BROOKS & PERKINS, INC.
1954 W. FORT ST. DETROIT 16, MICHIGAN
Offices in Washington and New York 60-T-6

New Enterprise

A majority interest in Antonio Vernocchi S. A. El Palomar, Buenos Aires, Argentina, has been p chased by Aluminium Limited. Re-equipment and pansion of facilities of the **aluminum foil plant** has ready begun.

A reversible window, available for both single a double glazing units, has been developed by Alt Metal Products Corp., 944 Longfellow Ave., New Yo 59. Unit is double weatherstripped with vinyl plast comes in aluminum or bronze; has removable tubu sash section; can rotate 360° and be locked at 18 position.

Heat-treating furnaces for nonferrous metals are n being designed and constructed by Amsler Morton C Pittsburgh. Edwin J. Bernard has been appointed ma ager of the firm's new Nonferrous Division.

A sixth metals manufacturing division has been a quired by Howe Sound Co., New York. It is Nava Co., Dallas, Texas, **carport and awning** manufactur Frank D. Mason, president of Navaco, will continue charge of the firm which was sold for more than million.

Organic coatings, test packs, container structures a **can fabrication** will be examined at the new Can Tec nical Service Laboratories recently established at t Trentwood, Wash., works of Kaiser Aluminum Chemical Corp., Oakland, Calif. Wayne Tibbitts lab chief.

A 1500-ton horizontal, high speed **extrusion press h** been ordered from Sutton Engineering Co., Pittsburg by Svenska Metallverken. The press and auxiliar equipment will be installed at the firm's Finspon Sweden, works.

Aluminum tooling plate (921-T-DC) of Pioneer Al minum, Inc., Los Angeles, is now being distributed b A. M. Castle & Co. in Ohio, Illinois and Missouri. A. M Castle's headquarters is at 3400 N. Wolf Rd., Frankli Park, Ill.

A large plant adaptable for **light manufacturing o erations** has been purchased by United Engineering Foundry Co., Pittsburgh, from Chrysler Corp. Th facility is on an 18-acre site at Hezlep St., in Young town, Ohio.

From 6 to 8 people can eat warm, fresh foods a summer picnics by using an **aluminum picnic pack** b Buckeye Div'n, Mardigian Corp., Wooster, Ohio. I cluded are five storage units which can also be used t cook in. The five units nest into one package and ar easily carried by a self-contained handle.

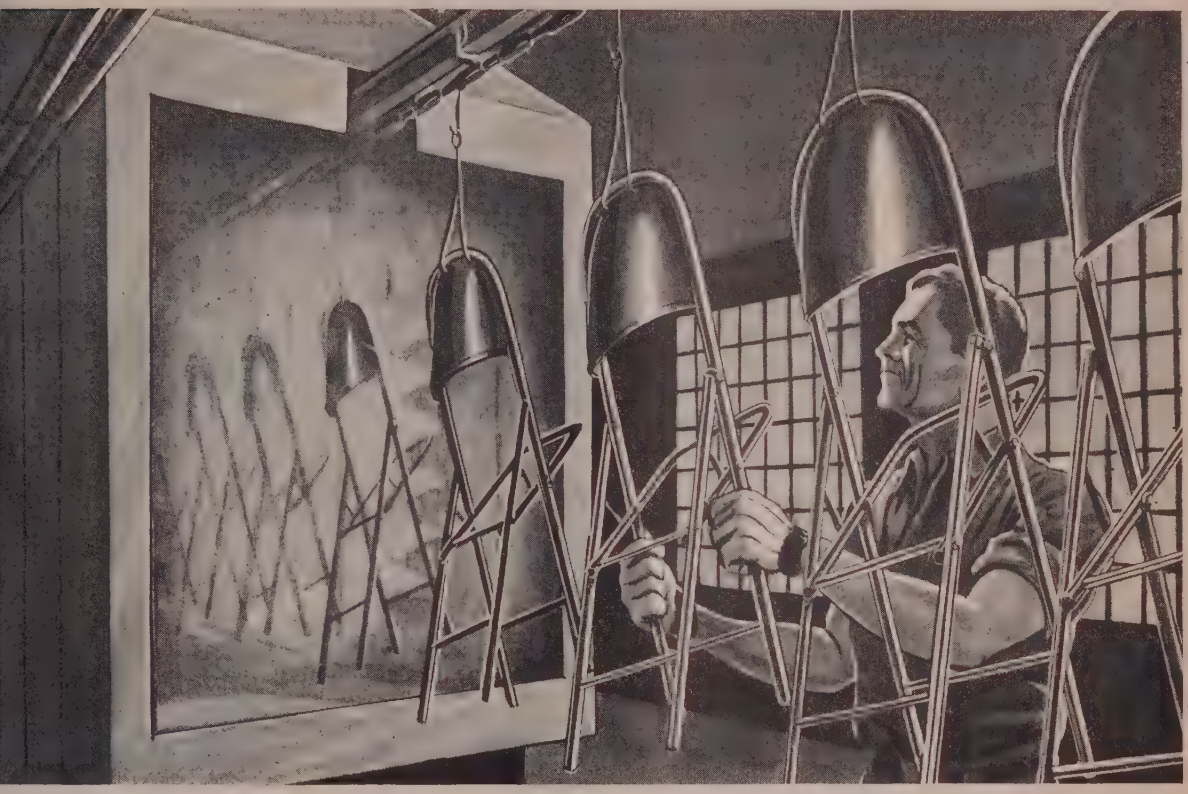
The total number of Schloemann aluminum **cabl sheathing presses** either supplied or under constructio has reached 21, according to the Dusseldorf (Germany firm. Japanese cable producers have just ordered fou more.

(Continued on page 22)

For the best in pressure spray washing

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 FIELD SERVICE MEN • OVER 160 MATERIALS



Even the highest spray washer pressures won't foam Oakite 161 alkaline detergent

Turn on the highest pressures to speed cleaning —you won't get any foaming problems with Oakite 161. Nor any etching problems, either. This alkaline detergent is specially designed for *safe* pressure spray washing of any metal—aluminum, white metals, brass, steel.

And it does a thorough job. Oakite 161 blasts off identification inks, grease, oil and shop soils . . . gives a completely clean surface for inspection or final finishing. Costly? Not at all. Extra long solution life and low concentrations assure low per-unit production costs.

One of a complete line of Oakite products for spray washers, Oakite 161 is complemented by heavy-duty solvent cleaners, moderate to light-duty alkaline materials. Ask the Oakite man to help you make the choice that's right for your washer . . . right for your products. Or send for Bulletin F-9773. Oakite Products, Inc., 26 Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

over 50 *Est. 1909* SCIENCE

years' leadership in industrial cleaning

GREATER RESISTANCE TO ALUMINUM ALLOY REACTION...

HARBISON-WALKER

CORAL brick... CORALBOND

The photographs at the right show the remarkable resistance of Harbison-Walker CORAL brick and CORALBOND mortar to penetration and corrosion by molten aluminum alloys.

These products are outstanding examples of refractories developed by Harbison-Walker Research to meet particular furnace requirements. In aluminum melting, these requirements are resistance to severe corrosion; resistance to mechanical impact during furnace charging; the necessity of avoiding contaminants in order to meet rigid alloy specifications.

THE CORAL BRANDS

Several CORAL modifications (85% alumina class) have been developed to allow selections of the very best refractory for each set of conditions involving the effects of molten alloys, thermal shock, spalling conditions, severe impact and abrasion.

CORAL BP is a hard-fired variation of stabilized aluminum phosphate-bonded brick.

CORAL P is a stabilized phosphate chemically-bonded brick.

CORAL is a hard-burned brick made with a special bond (patent pending).

With these brands in service, furnace wall accretions are very slight, contributing greatly to easy cleaning.

CORALBOND is a phosphate-bonded high-alumina mortar, unmatched for durability because of its high strength and corrosion resistance. These properties, together with its special composition, contribute to the avoidance of metal contaminants. In actual service, CORALBOND has provided excellent performance.

For monolithic construction, H-W HARCHROME CASTABLE and CORAL RAMMING MIX are outstanding. Many other types of castables and ramming mixes are also available.

HARBISON-WALKER REFRACTORIES COMPANY

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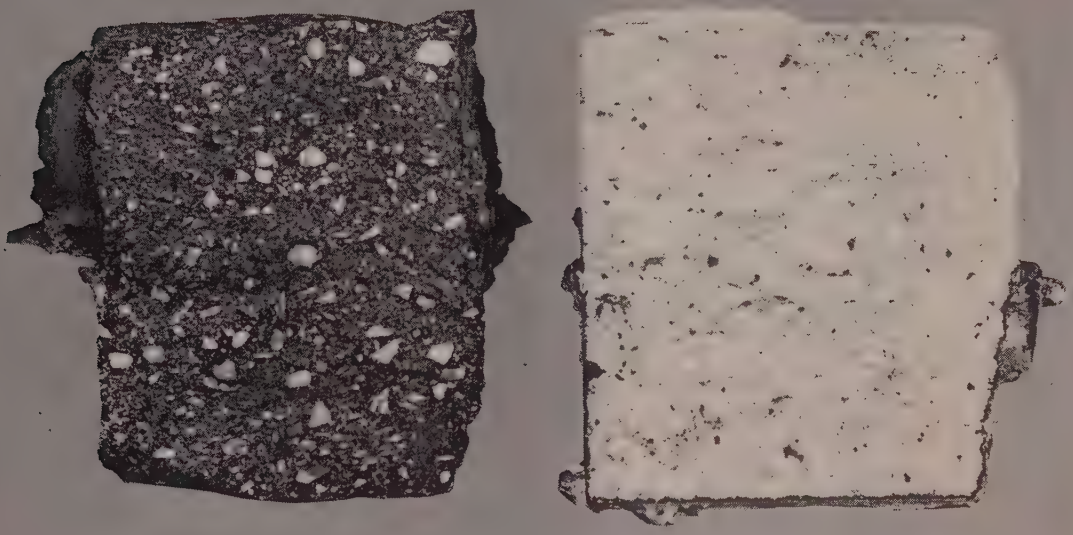
GENERAL OFFICES: PITTSBURGH 22, PENNSYLVANIA

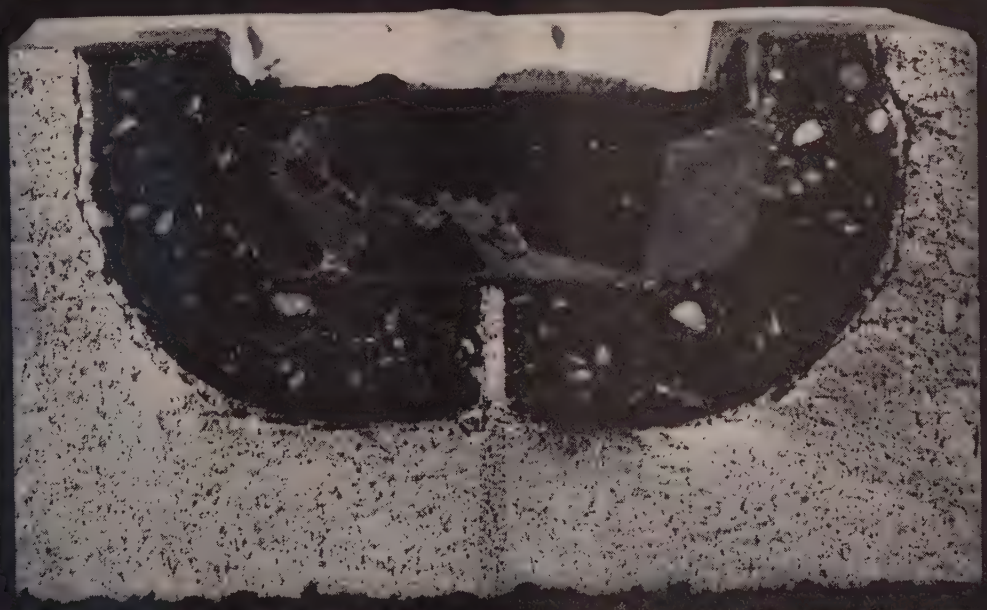
World's Most Complete Refractories Service

HW-61-6

Tests demonstrate excellent resistance of CORAL brick and CORALBOND to aluminum alloy reaction.



Aluminum Immersion Test—This picture illustrates the superior resistance of CORAL to penetration and reaction by a molten aluminum alloy as compared with a 90% alumina brick of high quality. After three weeks immersion in molten alloy (70-75) at 1500°F., the 90% alumina brick on the left is completely penetrated and appreciably affected while CORAL on the right is entirely free of damaging effects.

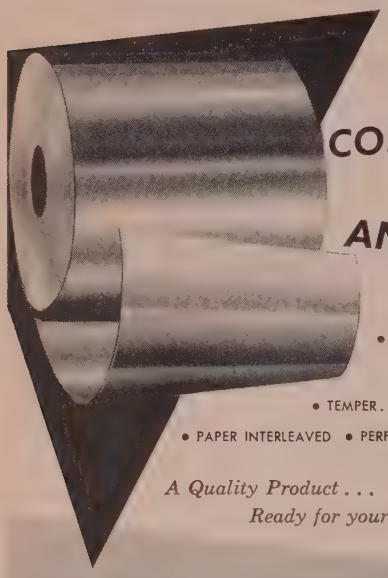


Mortar Joint Test —Photograph of laboratory cup-test with molten aluminum alloy shows remarkable resistance to penetration and corrosion by CORALBOND mortar in the joint cementing together two sections of 90% alumina brick.

For further information about these brands,
write Harbison-Walker Refractories Company, Pittsburgh 22, Pa.

ANODIZED ALUMINUM

• CLEAR • BLACK • ALL COLORS
• MATTE OR LITHO FINISH



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• GAUGES . . . FOIL AND SHEET
• 100# COILS X 12" WIDE
• TEMPER . . . DEAD SOFT TO FULL HARD
• PAPER INTERLEAVED • PERFECT CONTINUITY OF COLOR

A Quality Product . . .
Ready for your Production Line!

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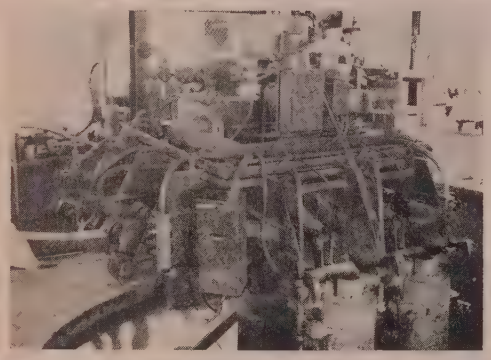

MAKE YOUR OWN BILLETS

Automatic rotating book mold billet casting machine with:

1. Power rotating and braking mechanism and automatic push-button indexing for eight mold stations.
2. All Vulcan molds with ¾" water cooling lines served through Chicksan ball-bearing swivel joint.
3. Molds tilt to 88° on ball-bearing tilting axles, powered by self-contained hydraulic system with separate push-button control at each mold station.
4. All molds cast to 36" depth. Six molds of 4-7/16" dia., four of 5⅛" dia., one of 6" dia. Molds have been in use less than 15 months; are in good condition.

All equipment has been in daily operation until removed for plant improvements late in January. Available for immediate shipment.

Box 275, MODERN METALS
435 N. Michigan Ave. Chicago 11, Ill.

The Cincinnati metal service center stock of Jose T. Ryerson & Son, Inc. has been supplemented wi Reynolds aluminum. Items include **plate, sheet, r bar, structurals and pipes,** and specialty items such tooling plate, treadplate and building sheet. Service also being given on roofing, siding, roof deck and w panels.

Magnesium tooling plate was used in fabricati mounting plates for hole-punching units used by Dee & Co.'s Horicon, Wis., farm implement plant. Adva tages over steel are magnesium's lightness in handli and its as-delivered flatness.

Anglers will be happy to learn that leather gra embossed aluminum **tackle boxes** weigh only two-thir as much as similar sized steel units. Old Pal In Lititz, Pa., makes the boxes, which contain two alum num trays and plastic inserts.

The Adrian, Mich., plant of Bohn Aluminum Brass Corp., Detroit, will be expanded so its productio of brass rod and shapes, and **aluminum and brass fo ings** can be upped.

A brightly colored aluminum **soft-drink cooler** has can and bottle opener in the carrying handle, a servi tray and cover and a 6-gallon capacity. It's made Heekin Can Co., 429 New St., Cincinnati 2.

Two new metals and **building products** distributio centers have been opened by Reynolds Aluminu Supply Co. The new buildings, in Jacksonville, Fl and Atlanta, Ga., replace smaller facilities.

Both Ford Motor Co. and Chevrolet recently plac orders for additional **die casting equipment.** Ford w install three 1200-ton units and auxiliary equipme at its Sheffield, Ala., casting plant; Chevrolet will r ceive five 1000-ton machines at its Toledo, Ohio, tra mission manufacturing plant.

Sections extruded from magnesium AZ-31C alloy a used extensively in **gyratory screening units** built Allis-Chalmers Mfg. Co., Milwaukee. Magnesium pa include bottom hopper, screen decks and pans, spac decks and deck stack cover. The machine is used the chemical processing and food industries.

Something new in **aluminum ladders** is a model Aladdin's Products Inc., 50 W. Broad St., Columbus which rolls into a compact bundle when not in us When unrolled and locked into position, the ladd handles the same as conventional units. It comes 12 and 16-foot heights, and is said to support 10 pounds.

An all-aluminum **chain link fence** approximate 7500 feet long now encloses the construction site the Haynes Steam Plant, Los Angeles Dept. of Wat and Power. The fence was made and installed at cost of $3.50 a foot by Crown Fence and Supply Co Ltd., Pasadena, Calif. Over 35,000 pounds of aluminu was used, including pipe, wire, bolts and fittings.

A utility trailer manufacturer has redesigned van trailers in aluminum, cutting weight 27% und steel unit's poundage. Result, says Parkhurst Mfg. Co Sedalia, Mo., is maintenance and fuel savings for user

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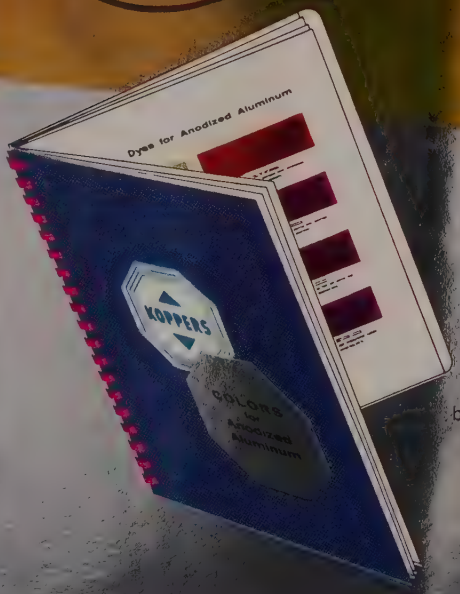

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Useful Data

omplete product descriptions and engineering data **Olin mill products and casting alloys** are presented ulletin 11. Twelve groups of products are detailed, uding those needed for piping, electrical and archi- ural uses. Also included is a guide to selection of t alloys, mechanical properties of casting alloys, tive fabrication characteristics of wrought alloys, a comparison of aluminum to other materials. copy, write Gayle Maile, Olin Aluminum, Metals ision, 400 Park Ave., New York 22, N. Y.

pex Aluminum Fluxes are cataloged in a new tabbed brochure brought out by Apex Smelting 2537 W. Taylor St., Chicago 12. The "Why" "How" of fluxing aluminum are given; five types luxes are given capsule descriptions; and detailed ctions are given as to their use. A. J. Peterson send this brochure on request.

ructural Aluminum Design, a 232-page book pub- ed by Reynolds Metals Co., has been revised. The hard cover edition includes tables of properties. lications and specifications, tables of maximum wable stress values, high and low temperature perties, alloy data sheets, weight tables and other inent information. Your letterhead request for this k should be addressed to Reynolds Metals Co., t. PR-42, Richmond 18, Va.

Speed Cut" abrasive cutting machines are cataloged collection of data sheets put out by Beaver Pipe ls, Inc., Abrasive Machine Div'n. An accompanying er pictures all models of manually and power oper- machines, designed for dry cutting, wet cutting, angle cutting and automated operations. Power ors of each model are given. A price list is also in- led. Write to Russell Herig, Abrasive Machine 'n, Dana Ave., Warren, Ohio.

Finish Systems for Magnesium" are set forth in ew illustrated brochure published by Brooks & kins, Inc., magnesium fabricators, of Detroit. Pur- e of the publication is to correct many erroneous ressions about magnesium's performance under a ety of conditions. The booklet discusses perform- e of bare magnesium, chemical dip conversion coat- and electrolytic anodize coatings. Given in chart n are directions for chemical cleaning of mag- um chemical dip conversion coatings, electro-chem- conversions and process specifications for mag- um finishing. Write to Ralph Gillespie at B&P, 0 W. Fort St., Detroit 16 for this booklet.

buying and estimating **guide for deep-drawn hollow ninum bar stock,** available in all machining alloys, just been revised by Harvey Aluminum, Torrance, if. Quick-reference tables in the new brochure give ghts, pre-calculated clean-up and machining allow- es, wall thicknesses, lengths, and mechanical prop-

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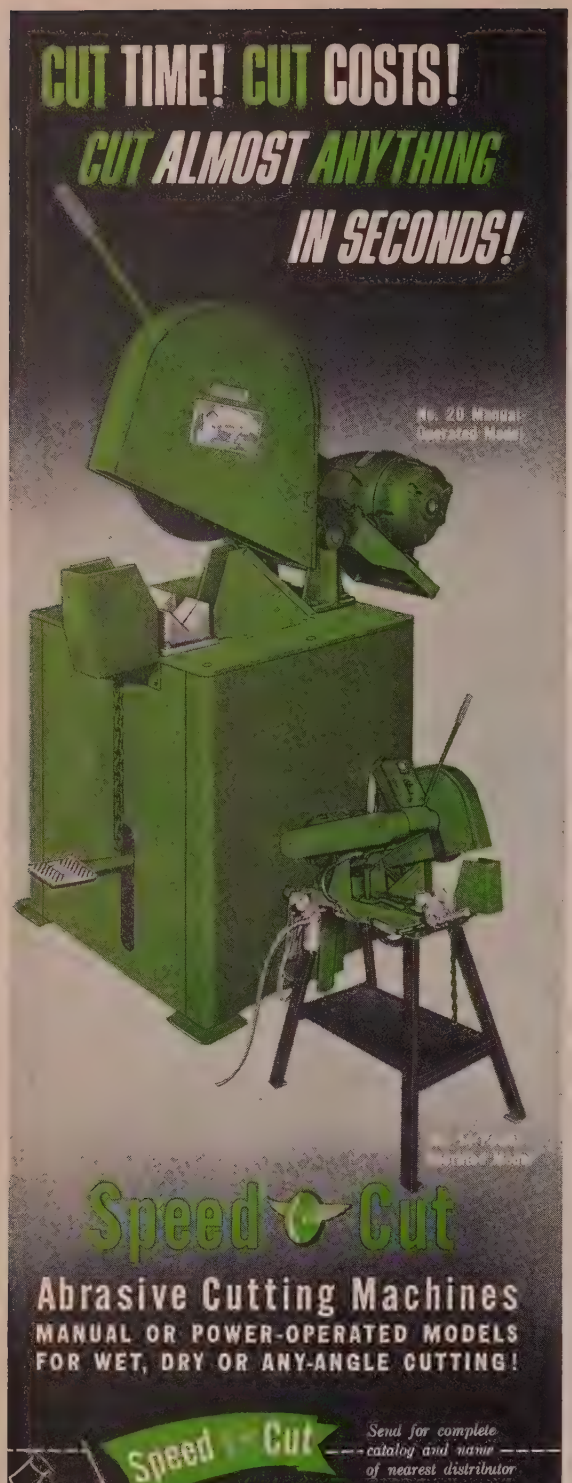

erties. Other sections of this enlarged edition discu shop-proven advantages of deep-drawn hollow sto over solid bar stock for machining applications. Harv Aluminum hollow bar stock is available in a full ran of sizes, both round and hex. Harvey has also produc a comprehensive brochure describing its forging fac ities—its equipment, types of forgings, and the lat technical information. Gene Alfred will gladly ma one or both of these booklets if addressed at 192 S. Western Ave., Torrance, Calif.

Facilities for **producing pre-painted aluminum coil sheets** were described in a feature article in Mode Metals which has now been reprinted. Strip co ing operations of Zegers, Inc., Peotone, Ill. are d scribed, from introduction of bare coil through pr treating, coating and baking. The article also tak a look at markets for painted coil. Write to To Koebel at Zegers' Zelite Div'n, 8090 South Chica Ave., Chicago 17, Ill.

The range and **capabilities of vacuum furnaces** bu by Lindberg Engineering Co. are outlined in a ne eight-page bulletin. Pictures and drawings show ho wall vertical retort vacuum furnaces, horizontal reto vacuum furnaces and vacuum bell-type and cold-wa vacuum units. Also pictured is a vacuum-atmosphe retort tube for research and pilot-plant use. Descri tions of the various installations pictured include us maximum operating temperatures and other pertine facts. Write to C. H. Stevenson, 2450 W. Hubbard S Chicago, for this booklet.

"Machining Kaiser Aluminum With Automatic Scre Machines" has been revised by its publisher, Kais Aluminum & Chemical Corp. "Extensive new inform tion is correlated with text of original booklet to sho advancements made in this important field of ma chining," Kaiser said. Write to Technical Publicatio Department, Kaiser Center, Oakland 12, Calif., fo this free booklet.

Howe Sound Co. of New York, parent company Quaker State Metals Co., Lancaster, Pa. has just pub lished a new 16-page booklet on its recently expande Rolling Mills Division. The booklet describes in deta the products, facilities and industries served by Quake State, a leading producer of **aluminum sheet** an building materials and the two other members of th Division—Stamford Rolling Mills Co., Stamford, Conn and Peerless Roll Leaf Co., Union City, N. J. Fo copies of the booklet, "Howe Sound Co., Rolling Mil Div'n," write Dept. TF, Howe Sound Co., 500 Fift Ave., New York 36, N. Y.

Mold release compounds, die coatings and lubricant made by G. W. Smith & Sons, Inc. are described i individual data sheets, easy to file and readily iden tifiable by a distinctive "Die Slick" label in uppe left corner. For copies of these sheets write to V. W Smith, at 1700 Spaulding Road, Dayton 32, Ohio.

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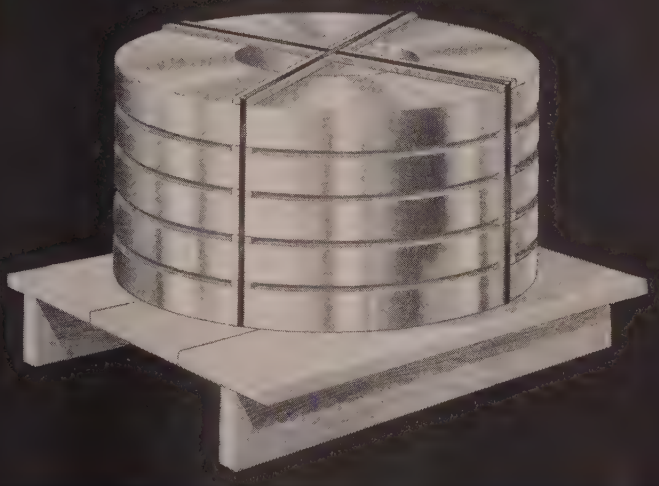

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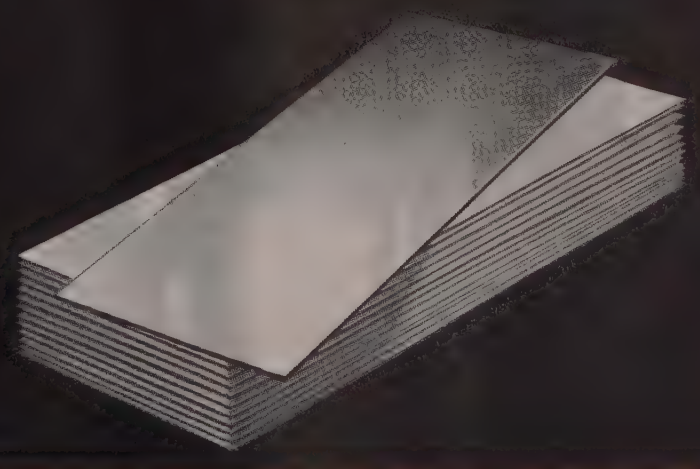


Part 2: Riveting and Stitching

FASTENING ALUMINUM

Continuation of Modern Metals report covers materials, equipment and techniques for riveting and stitching aluminum. Part 3 will deal with selection and use of threaded fasteners for aluminum.

RIVETING ALUMINUM

Advantages — types of rivets — selection of alloy, diameter, length — preparing rivet holes — driven head types — tools and drivers — machine riveting.

by F. L. Church, Senior Editor

RIVETING was a well established fastening method when aluminum appeared on the industrial scene late in the nineteenth century. Wrought iron rivets had been used for several decades in the fabrication of boat hulls, steam boilers, bridges, and other structures.

When development of stronger steel alloys stimulated the use of thinner plate and sheet in hundreds of new products, riveting technology was steadily up-dated to keep pace with the flourishing metal-working industry. Smaller rivets and improved rivet driving techniques were rapidly adopted by manufacturers in innumerable industries.

Thus, around the turn of the century, riveting was the logical joining method for assembling the first commercial aluminum products. Handles were riveted to the aluminum pots and pans that comprised the new metal's principal application in the early years of the aluminum industry.

As aluminum steadily penetrated new markets in the early decades of this century, riveting of the metal underwent a parallel development. Rivets themselves became a sizable market for aluminum—particularly after the development of the aluminum airplane set the stage for the astonishing growth of the aircraft industry. During World War II production of aluminum rivets for the aircraft program reached astronomical proportions.

Improved Rivets; Methods

Since the war, with other joining processes posing a growing competitive threat, rivet manufacturers have come up with radical improvements in both their products and methods of application. The common solid rivet has been joined by tubular, semi-tubular and split rivets, as well as by blind rivets and many other special types.

Rivet setting methods, especially for the small tubular and semi-tubular types, have been vastly improved in recent years. The introduction of new riveting machines, some with two or more spindles, rotary indexing fixtures, and other innovations, has kept riveting in the forefront of the high production fastening methods.

In terms of sheer volume, the rivet is probably the most commonly used fastener for aluminum. More than 75% of the aluminum product manufacturers who replied to a recent Modern Metals survey indicated that they use rivets; 38% said they use blind rivets and other special types (see MM, Jan. '61, p. 28).

These companies use aluminum in manufacturing an enormous variety of products, ranging from windows, doors, storefronts, and curtain walls, to such diverse items as carports, cooking utensils, conveyors, mobile homes, aircraft parts, lighting fixtures, truck bodies, awnings, shower enclosures, fans and blowers, skis, air conditioners, electronic chassis, furniture, major appliances, and missile ground support equipment. This is only a partial list.

Their reasons for riveting probably include any or all of the following advantages of the process.

Low Cost — A rivet is one of the cheapest manufactured metal items you can buy. Example: On the basis of an order for 100,000 pieces, a 7/16-inch aluminum (2117-T4 alloy) semi-tubular rivet with 1/8-inch diameter shank and with Alumilite No. 205 finish will cost you just 0.222-cent.

Thus, if your product can be assembled with 10 of these rivets, your outlay for fasteners will be about 2¼ cents per assembly. (Of course, this does not include cost of labor, equipment, etc.) The semi-tubular rivet is usually applied by hopper-fed machines—a high speed fastening process that will also tend to reduce costs.

This hypothetical case is intended not as a guide to the cost of a particul fastener, but as a demonstration of th potential economies inherent in the ri eting process.

Chances are, the service requiremen of the product will forbid the use semi-tubular rivets. Or perhaps the pr duction run is not big enough to justi machine riveting. In this case you cou probably use a standard solid rive which would produce a stronger join and be more practical from the ec nomic standpoint.

High Speed — Whatever the faste ing method, total assembly cost is als influenced by production rates. Rivetin can be a relatively slow process — han feeding of solid rivets, for example — a high speed machine operation wit semi-tubular rivets. Automatic hoppe feeding of these rivets to the work r sults in a dramatic increase in produ tion rates.

Even on foot-actuated machines assem bly rates of several hundred an hour ar not uncommon. Powered multiple-spi dle setups are said to push productio into the thousands per hour categor Since some modern riveting machine are tooled up to cycle at over 200 rpm the limiting factor is more likely to in volve positioning of the work tha machine speed.

High Shear Strength — There ar many facets of joint strength, but a wel executed riveted assembly is generall at its best in shear — owing to the rivet' cold forged grain structure—and at it poorest in fatigue or tension.

But suffice it to say that riveting wil provide adequate strength for mos common applications of light gaug sheet and shapes. If the assembly is ex pected to sustain heavy tensile or fatigue loads, it's best not to use semi-tubular rivets.

It is also worth noting that unlike

other joining processes, cold rivet- does not sap the strength of the treatable aluminum alloys, so it's necessary to beef up the gauge to pensate for loss of strength.

eliability — Relatively unskilled onnel can produce riveted joints of stent quality, particularly when ma- e riveting. The human element car- ess weight in riveting than in many metal joining processes. Add to he ease with which most defects are ted — cracked rivet, loose assembly, - and you have a joining process is more science than art.

daptability—With riveting, assem- an be a one-man operation using implest of tools, or a mass produc- procedure employing a battery of ines integrated into a conveyorized bly line. It will most likely fall where between these extremes, but ny case, joint uniformity is easily tained.

sign changes are accommodated out trouble, provided the limita- of your equipment and the process ept in mind.

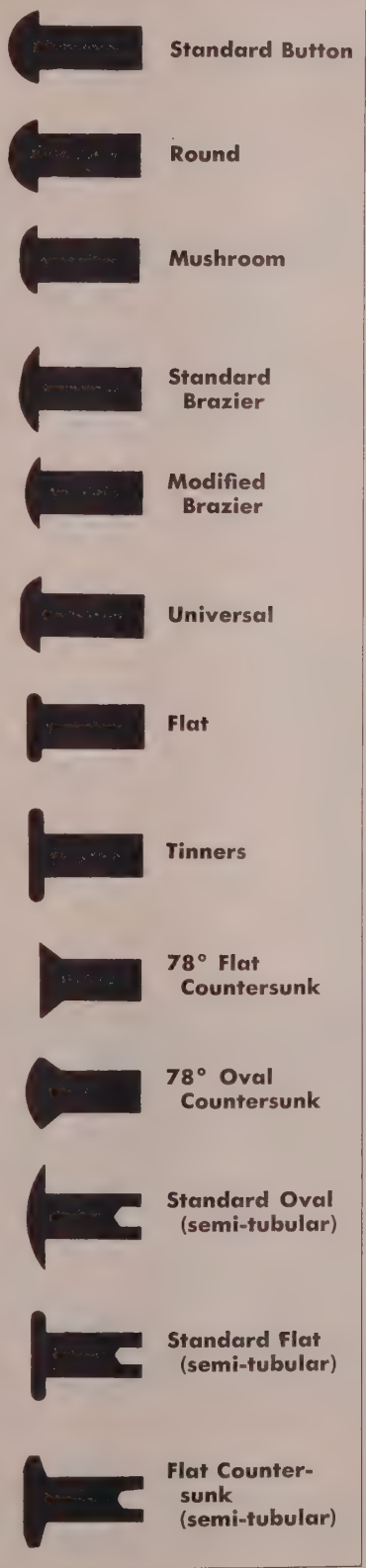
ersatility — Need a pivot point in ssembly? Chances are you can get us a sound joint, in one operation sing a shoulder rivet. A rivet may serve as an electrical contact, an t, a stop, a spacer, or as a locating for subsequent jigging operations. almost endless variety of unor- ox rivets are available for special- applications. Blind rivets are usu- sed when only one side of the work essible.

oad Strength Range—Aluminum s are produced in a wide selection lloys (detailed later), suitable for us driving methods and service re- ments. If additional corrosion re- ce is needed, or if a lustrous finish sired for esthetic reasons, they can nodized.

ssimilar Materials—Want to at- a light aluminum extrusion to a c product? Or an aluminum stamp- o a stainless steel sheet? Rivets may lete such assemblies quickly, per- ntly and inexpensively. The ability in dissimilar materials is a big ad- ge of riveting, but take care to l against galvanic corrosion when ng aluminum to other metals in ucts that will be exposed to weather her corrosive conditions.

ere is no universal joining method. ting, like other processes, has its ations. For a general comparison veral joining methods, see Part 1 is report (MM, Jan. '61, page 27). indicated by replies to Modern ls' fastener survey, however, rivet- vill fill the bill for both short run high volume assembly operations great variety of aluminum prod-

Fig. 1: Common Head Styles Of Small Aluminum Rivets



ucts. The following discussion will deal exclusively with the selection and use of small rivets, including those that are driven by hopper-fed riveting machines.

Which Rivet for You?

Solid rivets are classified according to size, with large rivets having shanks ½-inch in diameter and up, and small rivets having shanks up to 7/16-inch in diameter. The latter are further identified according to head style — button, high button, mushroom, brazier, universal, tinners, countersunk, etc. The principal head styles of small aluminum rivets are illustrated in Fig. 1.

Tubular, semi-tubular and split rivets (see Fig. 2 and 3) also come in various head styles. The 2-piece compression, or cutlery, rivets (shown in Fig. 2) are also available in aluminum, and are said to show great promise as versatile fasteners for specialized applications.

Small solid rivets are generally used when high shear or tensile loads must be sustained. They are not usually driven on high speed automatic riveting machines, but are the most common type used in fabricating aluminum products today.

Of the non-solid rivets, the semi-tubular type is most commonly used on aluminum products. Its distinguishing characteristic is the hole in the shank (see Fig. 3), which does not exceed 112% of the mean shank diameter. The rim of metal around the hole becomes the drive head, thus leaving the solid shank to carry shear loads.

According to the Tubular and Split Rivet Council, a properly specified and set semi-tubular rivet possesses shear and compression strengths comparable to those of solid rivets. This view is not universally accepted, however. Alcoa's manual, "Riveting Alcoa Aluminum," states that the semi-tubular rivet "is not as strong as a solid rivet of the same size and composition, either in tension or shear."

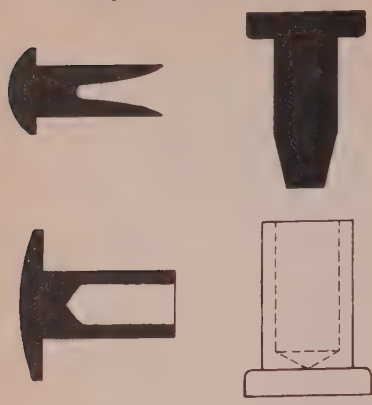
Semi-Tubulars Cut Costs

But don't overlook the cost-cutting advantages of the semi-tubular rivet. If you are presently planning a mass-produced product or assembly that is not highly stressed, you may reap significant production economies by switching to a semi-tubular type that can be set at a high rate of speed by a hopper-fed machine.

Full tubular and split rivets are not often used to fasten aluminum products. Since the hole in the shank of the tubular rivet (see Fig. 2) exceeds 112% of shank diameter — and often occupies the full length of the shank — this fastener does not possess sufficient strength for most metal products.

The split rivet is easily recognized by

Split, Tubular and Compression Rivets



■ *Fig. 2. Split rivet (top left) and tubular rivet (bottom left) are not often used on aluminum products. Two-piece compression rivets (right) are used in cutlery.*

its double-pronged shank, which is produced by sawing, broaching or punching a slot in a solid rivet (see Fig. 2). The punched variety is not suitable for sheet metal work. The other types, however, are sometimes used for fastening soft materials to light gauge sheet or shapes.

The double-pronged shape permits the split rivet to punch its own hole, thus eliminating pre-punching or predrilling of the material to be joined. Obviously, sheet metal applications are limited to light gauges and soft tempers. One rivet manufacturer reports, however, that at least one firm is using split rivets to fasten hinges to storm doors and screen doors (see Fig. 4).

Wherever possible, it's best to specify solid and semi-tubular rivets in standard alloys, head styles and sizes. They cost less than specials and are kept in stock by rivet manufacturers. In some instances, however, special rivets will prove to be either necessary or more satisfactory from the standpoint of design, appearance or production economy. Some of these special proprietary types will be discussed, along with other special fasteners, in Part 4 of this report.

Alloy; Diameter; Length

In selecting the best rivet for a given job, a good rule of thumb to start with is: Fasten aluminum with aluminum fasteners. The reasons are obvious enough: Aluminum rivets impart a neater appearance to aluminum products; they avoid the problem of galvanic corrosion; they are low in cost; and their light weight can be significant when large numbers of fasteners are used in an assembly.

Alloys —Rivets are available in several aluminum alloys, but the most common ones are 1100-F (commercially pure aluminum), 5056-H32, 2017-T4, 2117-T4, 2024-T4, 6053-T61, 6061-T4 and T6, and 7277-T4.

If strength requirements of the joint permit, you can save yourself trouble by selecting rivets in alloys 1100, 2117-T4, or 6053-T61. All of these may be driven cold, as received, don't have to be re-heat treated, and can be stored indefinitely without change in properties or driving characteristics.

The same is true of 5056-H32 alloy rivets. These are generally recommended for fastening magnesium assemblies. However, some manufacturers supply semi-tubular rivets in this alloy, and apparently recommend them for fastening aluminum assemblies.

Small rivets in alloys 2017-T4 and 6061-T6 may be driven cold, as received. For maximum drivability, however, large

Semi-Tubular Rivets

■ *Fig. 3. Holl shank of se tubular rivet clinched in roll head shown bel Most semi-tubul are set in rivet machines at h rates of speed.*

rivets in these alloys should be re-h treated immediately before driving. der them in -T4 temper if you plan re-heat treat. Treatment for 2017 volves holding at 930-950° F for 5 30 minutes, then quenching in c water.

For 6061, hold at 1030-1050°F for to 30 minutes, then quench in c water. Rivets in this alloy are sometir hot driven at a temperature of 990° 1050°F.

The drivability of re-heat trea rivets may be preserved for long peri by low temperature refrigeration. S ing them at —50°F will preserve th drivability for two weeks or more.

Rivets in 2024-T4 alloy should be h treated immediately before drivi They, too, can be refrigerated to ret drivability. As for high strength 72 T4, rivets in this alloy should be dri hot at temperatures of 850° to 975

Simplify With Three Alloys

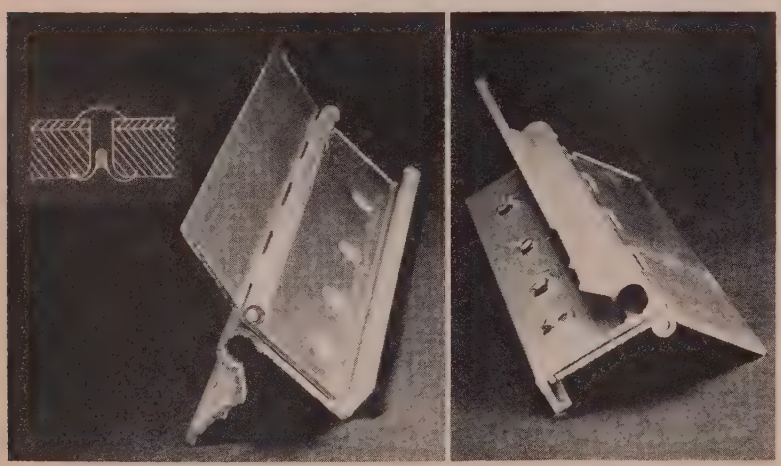
Good practice dictates choice o rivet alloy whose driven proper closely approximate those of the par metal. Three rivet alloys that will h dle a broad range of requirements, a do not require heat treatment bef driving, are 1100-F, 2117-T4 and 6 T61.

Rivets in 1100-F have a driven sh strength of 11,000 psi, and can be u to fasten assemblies of alloy 1100 tempers) or 3003 or 5052 in the nealed (-0) temper.

With 6053-T61 rivets you get a dri shear strength of 23,000 psi — suffici for assemblies in alloys 3003 and 5 (¼-hard and up), as well as in the and -T6 tempers of 6061 and 6063.

If your parent metal is 2024-T4 7075-T6 or 2014 in the -T4 or -T6 t pers, you can use 2117-T4 rivets wh develop an as-driven shear strength 33,000 psi.

Diameter — Selection of rivet di eter can be influenced by many fact but the common rule is that diame of the rivet should be no smaller t the thickest member to be joined,



■ *Fig. 4. Split rivets are used to fasten piano hinges to aluminum storm and screen doors as shown above. The 9/64-inch diameter steel rivets are set on a Milford Model 250 riveting machine fitted with a solid anvil. Machine will also set semi-tubular rivets of 1/8-inch diameter by 1-inch long to 3/16-inch diameter by 1-inch long. Split rivets punch their own holes, but many authorities do not recommend them for stressed joints. It is best to use aluminum rivets on aluminum.*

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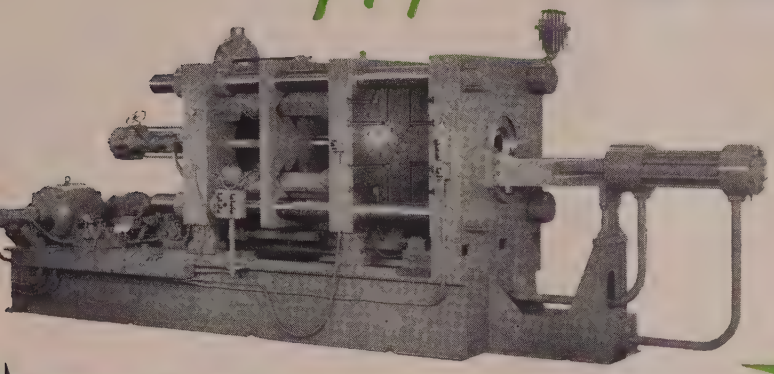

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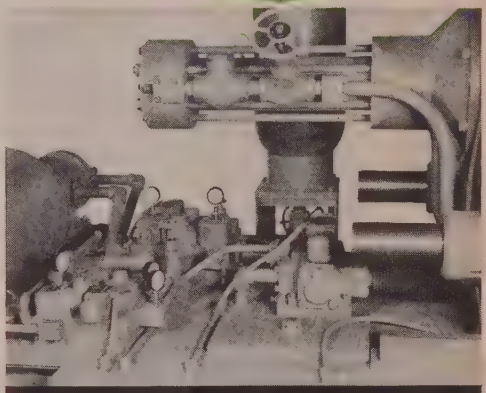

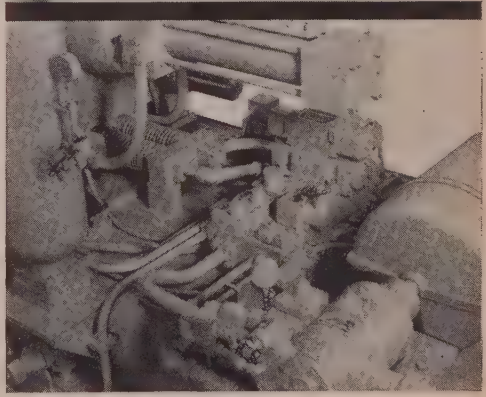

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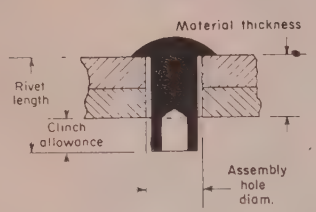
Fig. 5: Clinch Allowances, Hole Diameters, Drill Sizes for Semi-Tubular Rivets



Rivet Shank Diameter	Clinch Allowance	Hole Diameter	Drill Size
3/32"	.055"	.104"	37
1/8"	.062"	.128"	30
9/64"	.093"	.152"	24
5/32"	.093"	.165"	19
3/16"	.125"	.196"	9
1/4"	.156"	.266"	.266"
5/16"	.187"	.328"	.328"

Note: For rivet length, add clinch allowance to material thickness.

no more than three times the thickness of the thinnest member.

If the diameter is too small the rivet may lose its head. If it's too big the rivet might pull through the sheet, or the pressure needed to drive it may damage the sheet. If members of varying thickness are to be riveted together, it's best to locate the driven head against the thicker member.

Length – The optimum rivet length for a given job is governed mainly by total joint thickness, type of driven head, and the difference between rivet diameter and hole size. Rivet length is best determined by trial and error, but recommended lengths for two common types of driven heads on solid rivets are given in Table 1.

The approach is somewhat different when specifying semi-tubular rivets, in which case it's necessary to provide a "clinch allowance." This is the portion of the rivet that extends beyond the total material thickness, and it generally ranges between 50% and 70% of the shank diameter (see drawing in Fig. 5).

The correct rivet length (measured from the underside of the head to the end of the shank) is obtained by adding the clinch allowance to the total thickness of the material to be joined. Countersunk semi-tubulars, as well as solids, are measured from top of head to end of shank. Recommended clinch allowance, hole diameter and drill number for several diameters of semi-tubular rivets are given in Fig. 5.

Lap Joints; Butt Joints

Of the two principal types of riveted joints – lap and butt – the former seems to be the more common. Variations of the lap joint may include single riveted, single riveted with stiffener, double chain riveted, double stagger riveted, etc. (examples are shown in Fig. 6).

Butt joints may also be single or double riveted (i.e., have one or two rows of rivets), and the double job may be either chain riveted or stagger riveted. In addition, the butt joint may have one or more splice plates (see examples in Fig. 6).

Since several joint designs may satisfy requirements in a given case, the choice will probably be determined by overall design of the product. The principal objective, aside from merely holding two or more parts together, is to produce a joint that will safely transmit stresses imposed on the parts.

A butt joint will generally have better fatigue strength than a lap joint (other factors being equal), and a butt joint with two splice plates will be still stronger in fatigue. To beef up the fatigue strength of a lap joint, you can add a stiffener plate.

Factors that influence design of a joint include not only size of rivet (discussed above), but also edge distance, spacing between rivets (known as pitch), spacing between rows of rivets, and size of the rivet hole.

In machine riveting, joint design may also be governed in part by necessary clearances for tooling, as well as other factors.

Edge Distance – This is measured from the center of the rivet hole to the edge of the work, and the safe approach is to make it at least twice the diameter of the rivet. In riveting thin sheet, a safe edge distance would be 1½ times

Table 1: Rivet Lengths for Cone Point, Button Heads

(For hole diameters not more than 1/32" greater than rivet diameters.)

Grip (inch)	Rivet Diameter (inch) 1/4	5/16	3/8
CONE POINT			
1/8	7/16	1/2	9/16
1/4	5/8	5/8	11/16
3/8	13/16	13/16	7/8
1/2	15/16	1	1
5/8	1-1/8	1-1/8	1-3/16
3/4	1-1/4	1-5/16	1-5/16
7/8	1-7/16	1-1/2	1-1/2
1	1-5/8	1-5/8	1-5/8
BUTTON			
1/8	9/16	5/8	3/4
1/4	3/4	13/16	7/8
3/8	15/16	15/16	1-1/16
1/2	1-1/16	1-1/8	1-3/16
5/8	1-3/16	1-1/4	1-5/16
3/4	1-3/8	1-7/16	1-1/2
7/8	1-1/2	1-5/8	1-11/16
1	1-3/4	1-3/4	1-13/16

rivet diameter plus ⅜-inch for shea edges or ¼-inch for other types. As maximums, edge distance should exceed ten times the rivet diameter.

Rivet Spacing—Recommended m imum pitch is three times rivet di eter; maximum is no more than 24 ti the thickness of the thinnest mem being joined. Within these limits, r spacing may be governed by esth considerations. If the joint is to c heavy loads, however, it's best to l maximum pitch to no more than times the rivet diameter.

Spacing Between Rows – Thi rarely a factor in riveting light ga sheet and shapes because a single of rivets will usually do the job. If n than one row is involved, however, tance between them should equal least three-quarters of the distance tween rivets within a row.

Size of Rivet Hole – This is portant in that it influences the e tive diameter of the driven rivet. (assumed that a properly driven r expands to substantially fill the h Recommended hole diameters and responding drill sizes for several size small solid rivets are given in Tabl Hole diameters and drill sizes for s tubular rivets are shown in Fig. 5.

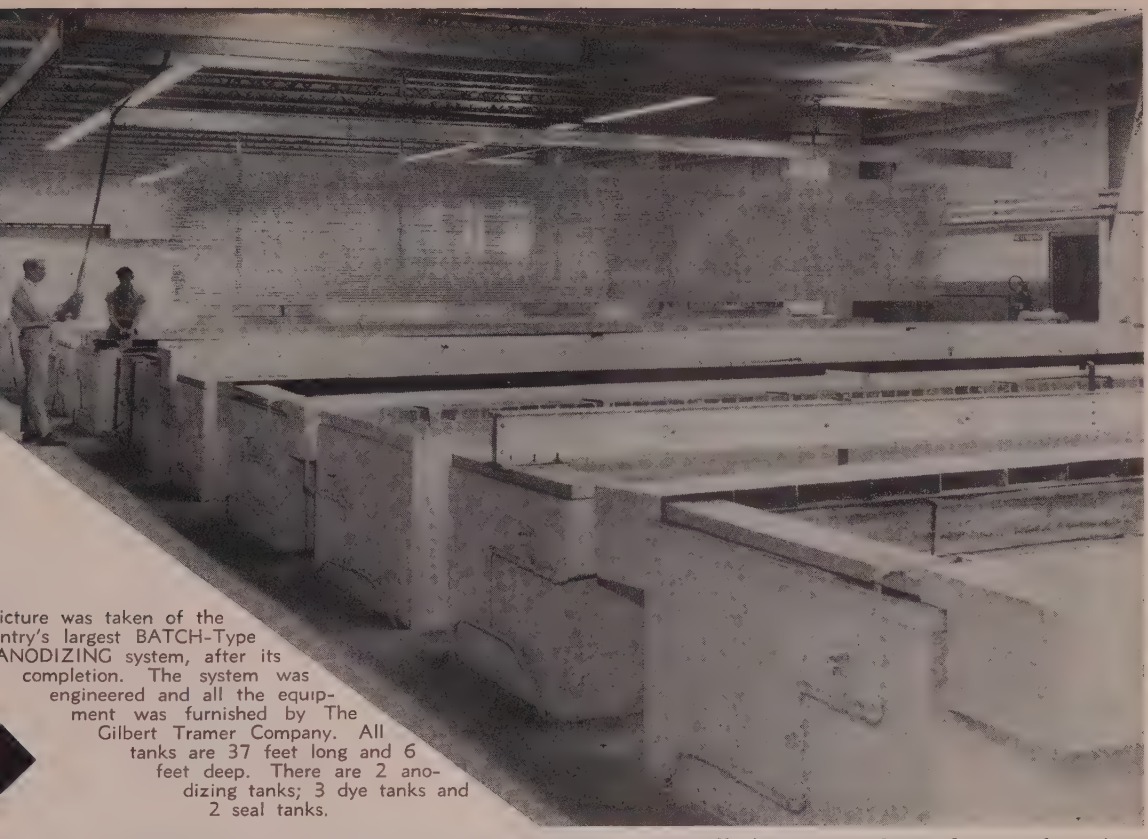
Preparing Rivet Holes

Drilling then reaming to final si the preferred method of preparing holes. It is also the most costly met Holes may also be drilled to size punched. The latter is frowned on most authorities, but it appears t widely used—especially for mass duced items that are not subjecte high loads.

Some high volume machine rive installations are tooled up to pu the holes, then feed and set the r in uninterrupted sequence. But bea mind that if you punch the holes run the risk of cracking the mate Even minute cracks can give rise t tigue failure in an assembly tha exposed to severe vibration.

Drilling of holes will suffice for m jobs, and the equipment may r from small electric or pneumatic h drills for short run work to mul spindle machines for high volume duction. Some pneumatic drills the advantage of controlled drill s when spotting a hole. When hand ing it's a good idea to center punch hole area to prevent the drill wandering and producing an off tion hole.

Needless to say, accurate positio of holes is vital. Conventional jig fixtures may be used. If a sheet m part is to undergo considerable f ing, it might be best to drill rivet h after fabrication in order to main



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alignment. Another approach, if fabrication is not severe, might be to punch small pilot holes along with a stamping or forming operation, then drill the holes to size afterward.

For the best results in riveting, burrs and chips should be removed. In progressive riveting there will probably be some creep of the metal as driving of rivets proceeds. If this is allowed to continue, holes at the end of the line will be out of alignment. Better clamp the parts tightly together with either temporary sheet holders or bolts and nuts placed at regular intervals.

Flush riveting with countersunk rivets poses special problems, but this technique is usually confined to aircraft construction. It is necessary to provide countersunk rivet holes. On heavy gauge material this is done by machine countersinking; on thin stock by dimpling. The two can be combined if a thick member and a thin one are to be riveted together. For a thorough discussion of aircraft riveting, see "Riveting Alcoa Aluminum," by Aluminum Co. of America.

Which Driven Head?

The force needed to drive a rivet — hence the power and cost of driving equipment—is strongly influenced by the shape of the driven head. The flat head uses the simplest of tooling, but it requires the highest driving pressure.

Table 2: Hole and Drill Sizes for Small Solid Rivets (cold driven)

Rivet Shank Diameter	Hole Diameter	Drill Size
1/8"	.1285"	30
5/32"	.159"	21
3/16"	.191"	11
1/4"	.257"	F
5/16"	.323"	P
3/8"	.386"	W
7/16"	.453"	29/64"

The standard button head (see Fig. 7) needs less driving power, but you're better off with the cone point head (also shown in Fig. 7), which was developed specifically for aluminum rivets.

The pressure needed to drive a cone point head on a given rivet is half (or less) of that needed to drive a standard button head. Example: Driving tests by Alcoa indicate that 2 tons of pressure will form a cone point on a 3/16-inch rivet in 6053-T61 alloy, while a standard button head in the same size and alloy normally needs 4 tons.

The cone point also requires less material, and one rivet set can often be used to produce cone point heads on several sizes of rivets. Though small, this head shape is big enough to exploit the strength of the rivet shank in straight tensile pull. Proportions for both the heads and rivet sets for cone point and button heads are shown in Fig. 7.

Tools and Drivers

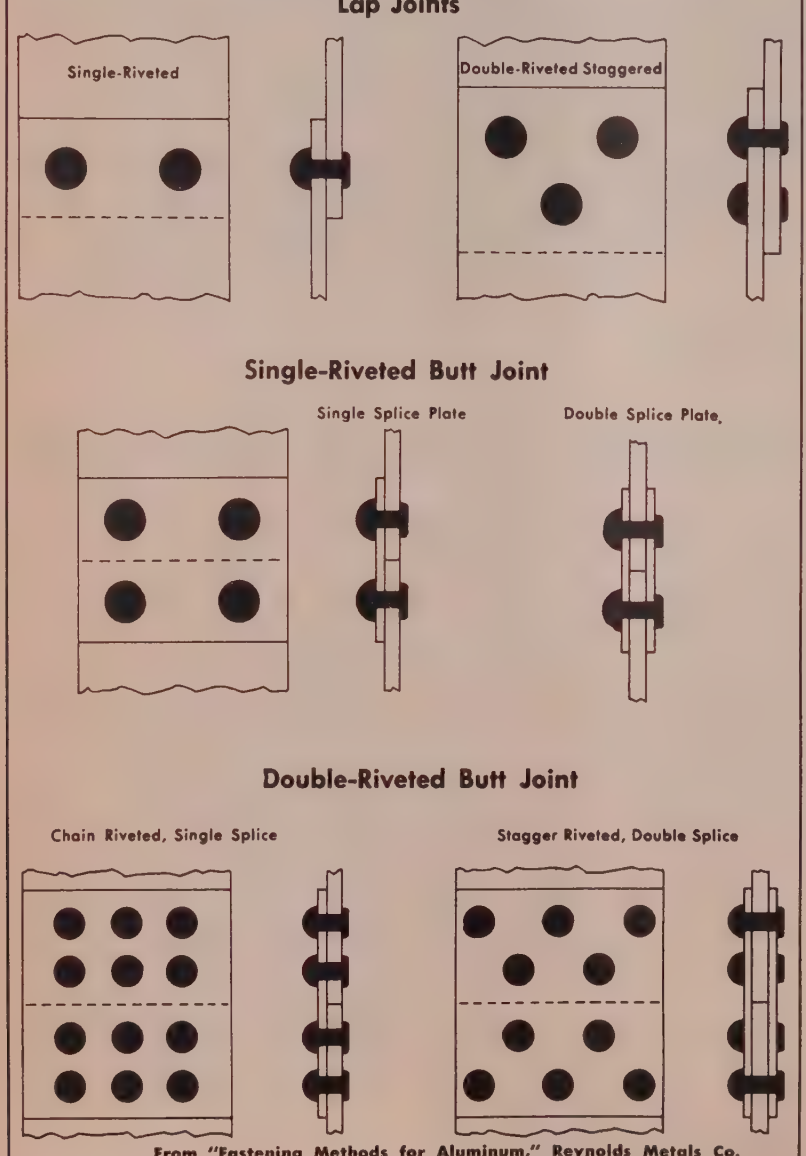
To drive a rivet you need a bucking bar, a rivet set, and pressure. In general practice the bucking bar is placed against the manufactured head of the rivet on one side of the work; the rivet set against the shank end of the other side. The application of pressure (or impact, in the case of hammers) forms the driven head and upsets the shank to fill the rivet hole.

Design and construction of these tools is important. The rivet set is machined from hardened steel. Edges should be rounded to prevent damage to the work. A smoothly polished rivet set eases the flow of metal and enhances the finish of the driven head.

The bucking bar may be machined from cold rolled steel plate and should have sufficient mass for the size and alloy of the rivet being driven. Its weight should be uniformly distributed with reference to the rivet head. The cup should be slightly wider and shallower than the manufactured head of the rivet so that the shank will not be driven up into the head during driving.

Finish of the cupped area is not as critical as in the case of rivet sets. In fact, some authorities suggest that slight

Fig. 6. Several Types of Riveted Joints



From "Fastening Methods for Aluminum," Reynolds Metals Co.

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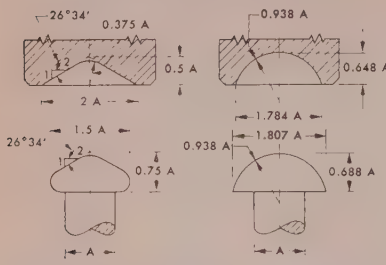
Fig. 7: Rivet Set & Head Dimensions for Cone Point and Button Heads



■ ***Cone point head (left) was developed Specificaliy for aluminum, is easier to set, requires shorter rivet.***
(From "Riveting Alcoa Aluminum," Aluminum Co. of America)

friction between bucking bar and rivet head will aid in holding the bar steady during driving.

Small solid rivets may be driven by hand or with hammers or squeezers. Manual driving is not recommended; it's slow, costly, and undependable. The squeeze riveter produces the best results. It is essentially a small press, usually pneumatically or hydraulically powered, with the rivet set and bucking bar (called dolly sets) fitted into its jaws.

Since the tooling is precisely aligned and the power can be adjusted to deliver the same pressure at every stroke, the squeeze riveter is a reliable tool for producing well centered, uniform heads. And since the head is formed in one slow squeeze, there is less risk of head cracks caused by excessive cold work.

Squeeze riveters may be portable, semi-portable (with overhead support), bench mounted or floor mounted. In some installations, multiple squeezers are rigged up to drive a dozen or more rivets at a time.

Limitations of the squeeze riveter include its relatively slow operation, difficult maneuverability on complicated parts, and the excessive weight of units that can deliver enough pressure for driving the larger and stronger rivets.

Of the several types of hammers available, the single-shot device is usually best for driving small aluminum rivets. The driven head is formed in a single blow, thus simplifying control and minimizing the risk of head cracks resulting from too much cold working.

But the single shot hammer is limited to the small, easily driven rivets. There is also the danger of damaging light gauge sheet or shapes.

Low speed hammers—900 to 2000 blows per minute—are preferred over high speed units that deliver up to 5000 blows a minute. The former are easier to control and cause less cold working of the driven head.

For driving small rivets (7/16-inch diameter and under) in alloys 2117-T3 and 6053-T61, hammers with 1⅛-inch bore and 3-inch stroke or 1-1/16-inch bore and 4-inch stroke will usually be adequate. When driving small rivets in the soft 1100 alloy, a hammer with ½-inch bore and 4-7/16-inch stroke might be better.

Overdriving of rivets, resulting from excessive pressure, can cause serious trouble. You can spot this type of malpractice by watching for buckling of the riveted parts (especially in light gauge sheet) or bulging or tearing of the work adjacent to the rivets. Other common defects and the probable causes are shown in Fig. 8.

Machine Riveting

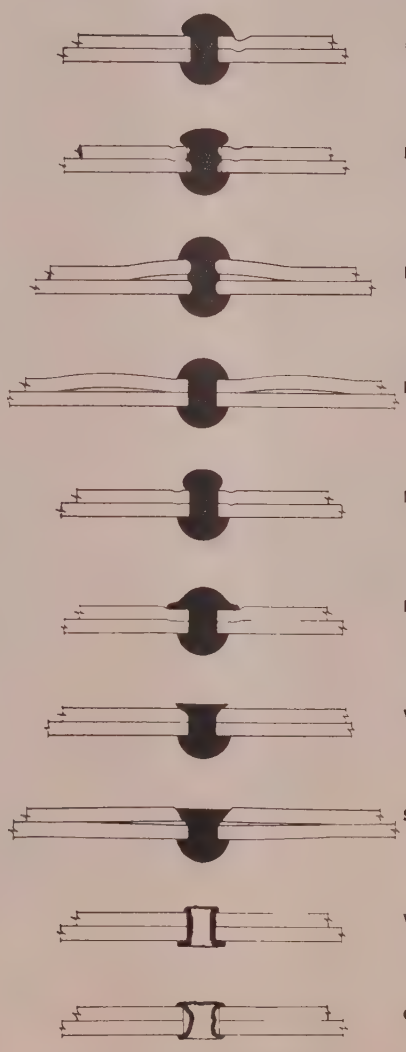
Machine riveting differs dramatically from the driving techniques described above. The objective, of course, is t replace manual operations wherev possible, thereby speeding productio and maintaining more uniform result

Machine riveting can be classified a automatic or semi-automatic. In th latter, the machine positions and se rivets into workpieces that have bee pre-drilled or pre-punched. This is th most common type. An automatic ma chine punches or drills the holes, the positions and sets the rivets.

In both cases, the operator position the work. There are also the so-calle full automatic machines that not onl drill the holes and drive the rivets, bu also feed the work.

In any case, the essence of machin riveting is the automatic setting an driving of the rivet. Basically, the m chine consists of a pedestal, upon whic

Fig. 8: Defects (and causes) in Riveted Joints



DAMAGED SHEET; WEAK HEAD
(rivet struck incorrectly)

DAMAGED SHEET; WEAK HEAD; LEAKAGE
(rivet hole too large)

FIN OR COLLAR BETWEEN SHEET
(rivet not pulled tight)

BULGING OF SHEETS
(poor fit; rivet too tight)

DAMAGED SHEETS; WEAK HEAD
(rivet too short)

RIVET AND SHEETS DAMAGED
(rivet too long; overdriven)

WEAK JOINT WHEN TRIMMED FLUSH
(countersink too shallow)

SHEET NOT HELD UP; LEAKAGE
(countersink too deep)

WEAK HEAD ON TUBULAR RIVET
(rivet too short)

CRIPPLED RIVET; WEAK JOINT
(hole too large)

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is mounted the drive mechanism and hopper feed (see Fig. 9). The hopper automatically feeds rivets to a raceway which deposits them, one at a time, in the jaws of the ram.

Also located in the ram is the driver, which corresponds to the bucking bar in conventional riveting. As the ram descends, the jaws come to a stop and the driver pushes the rivet through the jaws and against the spring-mounted plunger pin of the rollset, located in the lower arm of the machine.

The plunger pin acts as a rivet set. It protrudes through the hole in the work, and guides the rivet into place. The descending rivet depresses the plunger until it reaches a stop, at which point the clinch is made.

Construction of tools is critical in machine riveting. Driver diameter is usually .005 to .025 inch smaller than the rivet head diameter. The working end of the driver is shaped to the contour of the manufactured rivet head.

Plunger pins, on the other hand, are .002 to .005 inch larger than the rivet shank for rivets up to 3/16-inch diameter, and equal to shank diameter for rivets up to 5/16-inch in diameter.

Length of stroke, which governs the length of rivet that may be driven, may range from 1-1/16 through 5½ inches on standard machines. Throat depth, which determines maximum size of assembly which may be riveted, varies from 4 through 20 inches or larger.

Mass Production Tool

Riveting machines may be foot actuated (for small, easily driven rivets) or electrically, pneumatically or hydraulically powered. Some machines are bench mounted; others are floor units. They can be fitted with two or more spindles to drive several rivets per wallop; combined with slide or dial type indexing fixtures that carry an assembly through several riveting operations; or integrated into a production line.

Riveting machines may have quick-change raceways for fairly easy changeover from one rivet size to another; large throat clearances that will accommodate sizeable assemblies; dual spindles that are adjustable through a wide range of spacing for double riveting various sized assemblies; extra long strokes for fastening awkward items such as lawn chairs; or special pressure pads for riveting brittle parts, as well as castings or moldings that may vary in thickness from part to part.

Many riveting machines are equipped with solenoid actuators that reduce operator fatigue, enabling him to concentrate on speed of transferring and positioning of parts. They may also be fitted with back-feed raceways that permit the placing of rivets close to flanges and other obstructions.

In short, machine builders can rig up special tooling on modular units to solve an almost endless variety of fastening problems. The point is that these machines have transformed riveting from a plodding job lot process to a versatile, full fledged mass production tool.

Limitations, Too

Machine riveting also has its limitations. It's confined to tubular, semi-tubular and split rivets, and of these only the semi-tubulars have sufficient shear strength for aluminum products.

Even the semi-tubulars may not be suitable if the assembly must withstand fairly high tensile or fatigue loads. The driven head of this rivet (see Fig. 2) is actually a roll set "clinch" which, according to some authorities, does not exploit the full latent strength of the rivet.

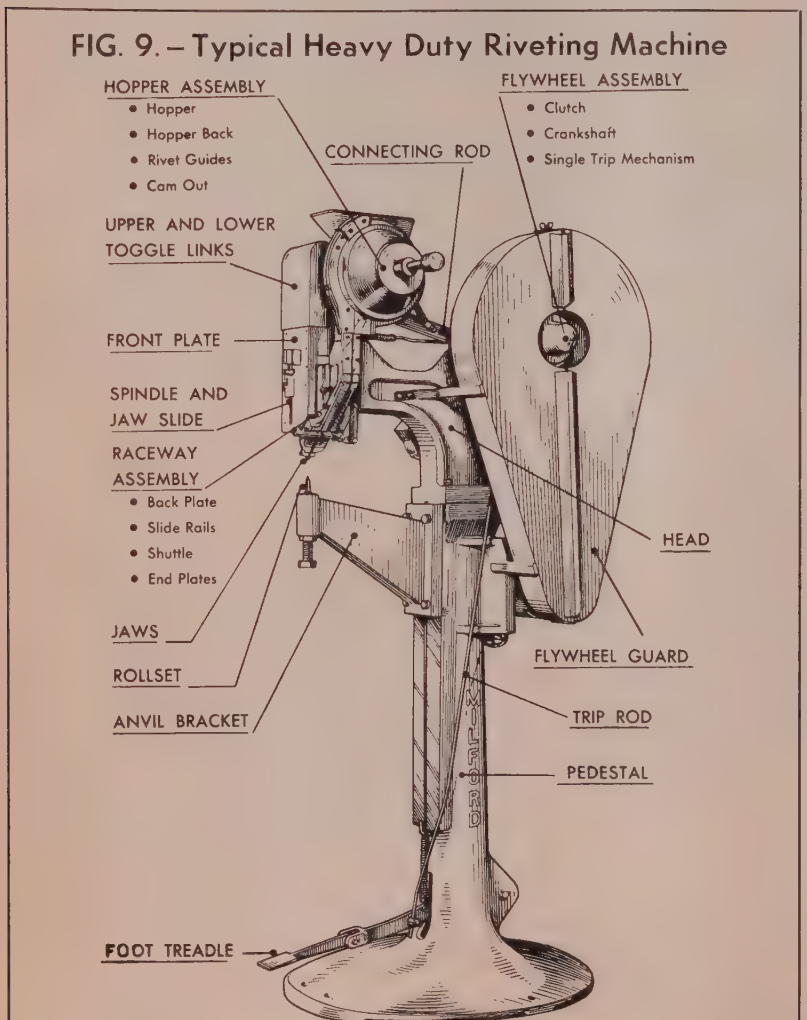
There's a limit on size of rivet, too, but you can get standard machines that will handle diameters up to ⅜-inch and lengths up to nearly 1½ inches—adequate for many metal products.

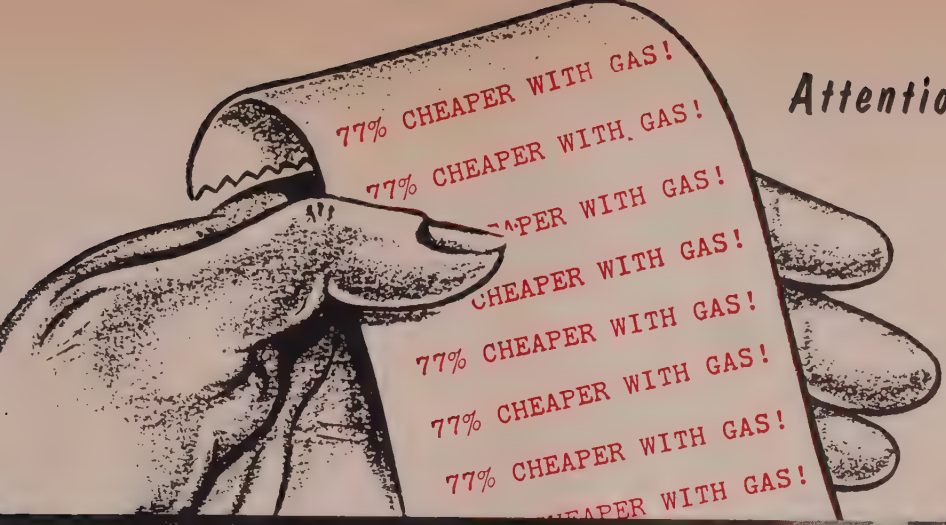
Machine set up and maintenance may demand the attention of personnel with engineering savvy—the type of men who command fairly high wages. Since equipment, too, can be costly compared with that for conventional riveting, production runs should be substantial to justify machine riveting.

(Equipment cost may not be too serious a deterrent, however. For slightly over a thousand dollars you can get a floor mounted, single spindle riveter (like that in Fig. 9) that will handle semi-tubulars ranging from ⅛ to 3/16-inch in diameter and from 3/16 to 1-inch long. A standard feature of such a machine may include quick-change raceways, permitting you to switch rapidly from one rivet size to another.)

In the final analysis, however, the best way to determine whether machine riveting is technically and economically practical for a specific product or line of products is to consult your rivet supplier or a machine manufacturer.

FIG. 9.—Typical Heavy Duty Riveting Machine

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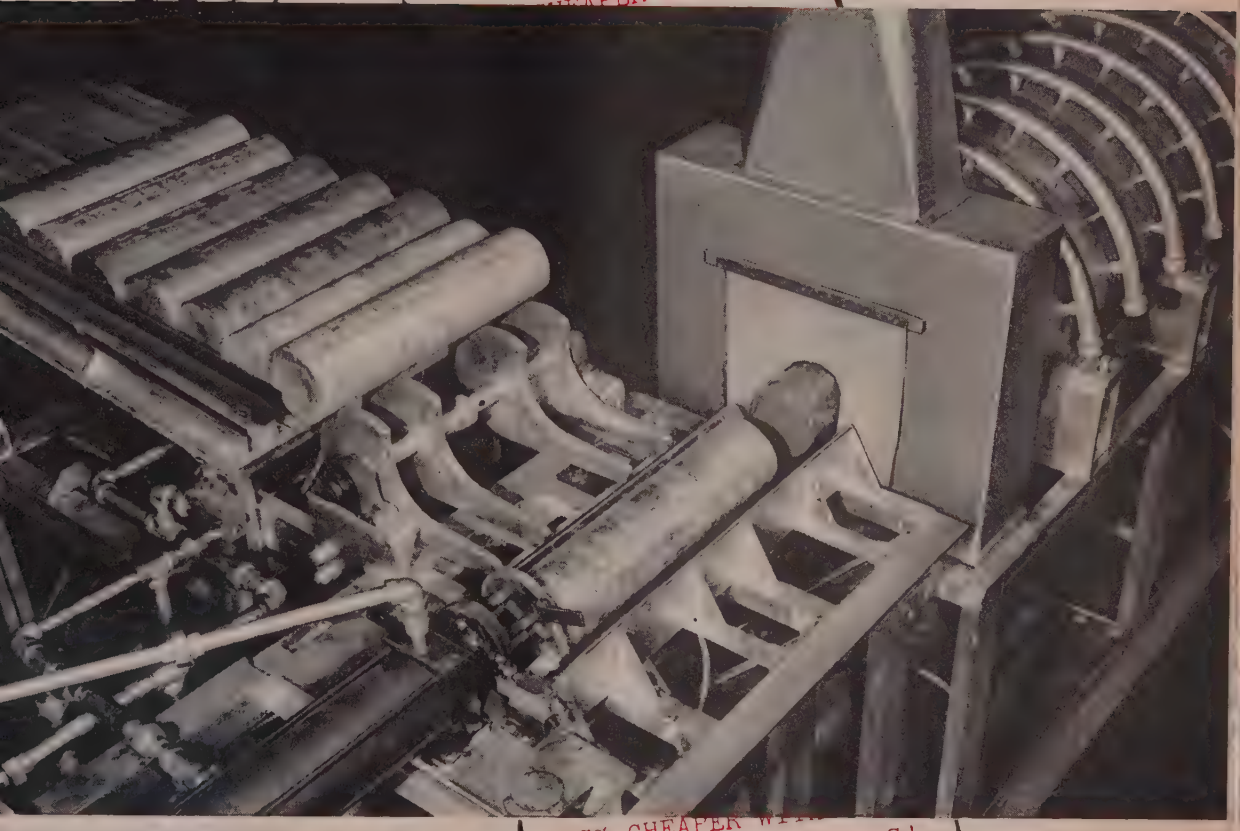

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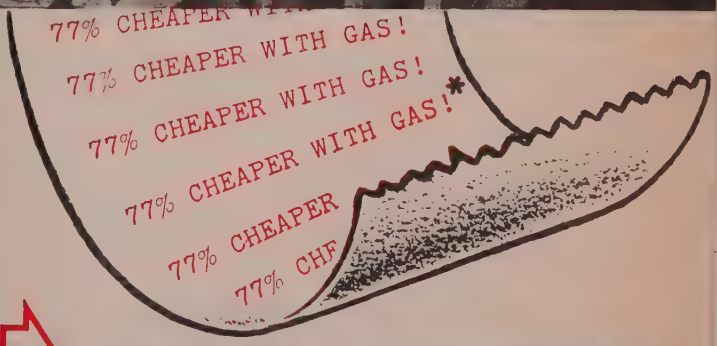

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MORRISON ENGINEERING

STITCHING ALUMINUM

Advantages of the process – What can be stitched – Terminology – Types of stitches – Stitching methods – Wire – Machines

by K. B. Rhodie, Associate Editor

METAL stitching has been applied to a seemingly endless array of products since its first known use in 1934, when felt pads were stitched to the metal channels of automobile windows.

A bookbinding machine (used to apply stitches such as those holding this magazine together) handled this first job. It was so successful that stitchers were redesigned into the rugged, almost foolproof equipment now used to slam heavy wire staples through all sorts of metals and non-metals.

Stitching has been used widely on aluminum because of the metal's low density and hardness in comparison to ferrous metals.

Stitched aluminum products include furniture, toys, mobile home wheel housings and appliances. A truck manufacturer stitches roofs to sides of its all-aluminum trailers: an aluminum fabricator stitches radar grills; another stitches insulation blankets for jet engine afterburners.

Stitching has been used in assembling aluminum garage doors, on sheet metal jobs such as furnace and air conditioning ducts and blower installations, in joining aluminum and rubber sandwich panels for aircraft, to attach handles to garbage cans, to fabricate small heat treating ovens, to attach non-skid rubber feet to aluminum ladders. The list can go on and on. (See case history.)

Two companies manufacture metal stitching machines: Acme Steel Co., Chicago 27, Ill.; and Bostitch Inc., East Greenwich, R. I.

Up to 300 stitches can be made a minute, so production speeds are only limited by how fast operators can position work. This means properly applied stitchers can produce joints as fast, or faster than, riveting or welding. But speed isn't the only advantage.

Advantages of the Process

When stitching, no backing material is needed; pre-punching or drilling isn't necessary; work doesn't have to be clamped, or metal cleaned. Workmen need no special skill; can be trained quickly to run a stitcher. Inspection is simple since a quick glance will tell if a stitch has penetrated all work and is properly clinched.

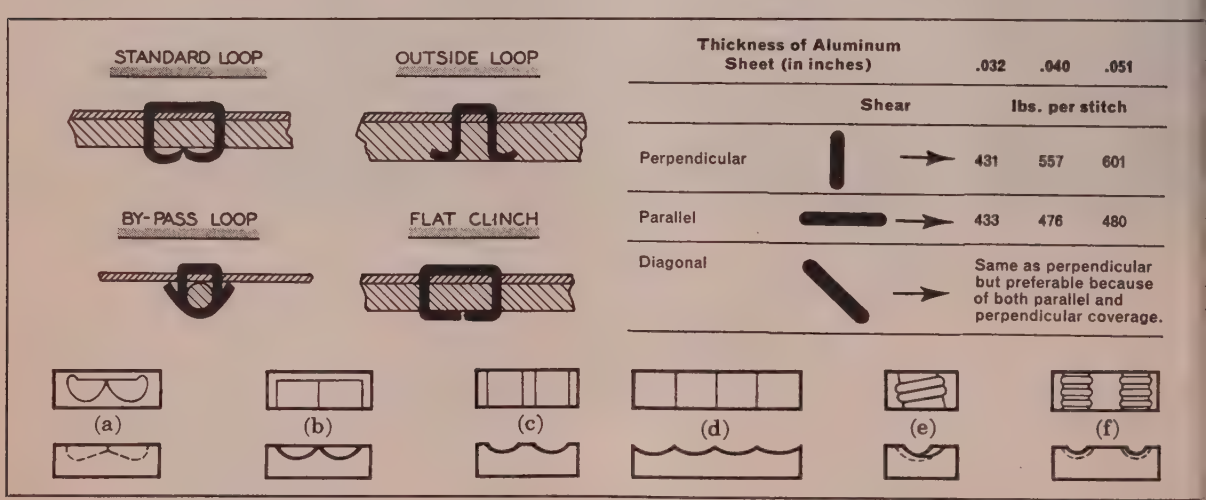
Sudden stitch failure is rare. A stitch loosens gradually; can usually be spotted before it fails completely.

What Can be Stitched?

Stitching can join aluminum to aluminum and to a wide range of other light gauge metals and non-metals. It can also be applied to cold and hot rolled steel, galvanized steel, stainless (full hard, ½-hard, ¼-hard, or annealed), sheet copper, soft sheet brass and other metals.

In determining maximum thickness of materials which can be stitched, hardness as well as machine size and wire hardness and gauge must be considered. John Prout, of the metal stitching department of Acme Steel, puts it this way:

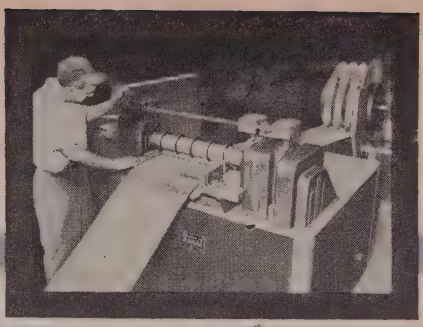
"The thickness of metal which can be stitched is directly proportional to

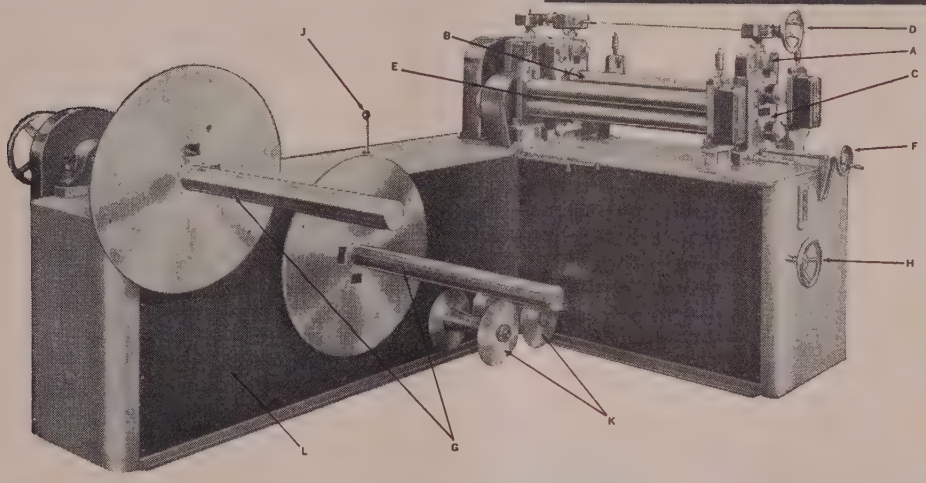


Thickness of Aluminum Sheet (in inches)		.032	.040	.051
	Shear	lbs. per stitch		
Perpendicular	→	431	557	601
Parallel	→	433	476	480
Diagonal	→	Same as perpendicular but preferable because of both parallel and perpendicular coverage.		

■ *FIG. 1. At upper left, four types of clinches are diagrammed to show how stitches look in work. Diagram at right shows stitching patterns (in article, perpendicular is referred to as parallel, parallel as longitudinal). Information with diagram tells what shear strength stitch patterns have with various gauges of aluminum sheet. In stitching, if yield strength of non-metallic material is less than that of stitching wire, loop clinch is more than adequate. Shown below are clincher profiles. Each has a particular function: (a) tear drop, for clinching on the metal side; (b) two groove with one end closed for all purpose use; (c) and (d) two or four groove, open, for imbedding the clinch in non-metallic materials; (e) by-pass for ¼-inch crown, clinch on metal; (f) outward clinch for ¼-inch crown for non-metallic materials. Illustrations supplied by Acme Steel*

How **STANAT SLITTERS** *Offer* **NEW ECONOMY**





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C. ROLLER BEARINGS: Proportioned to take loads in excess of normal requirements. Rugged three (3) bearing design increases rigidity and minimizes arbor droop when outboard housing is swung aside. This construction aids in the production of clean, burr-free stock and prolongs cutter life.

D. WORM GEAR SCREWDOWN: Offers an effective means for providing simultaneous adjustment of both arbor ends. Arbor parallelism is not disturbed when vertical settings are changed nor when the outboard housing is removed for setup purposes. A single micrometer dial facilitates precise positioning of the arbor and provides accurate control of cutter overlap, assuring increased cutter life.

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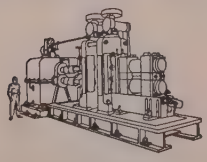
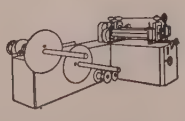
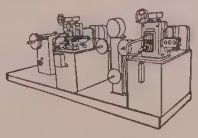
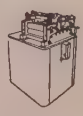








MFR'S OF ROLLING MILLS, GANG SLITTERS, WIRE FLATTENING MILLS, ROLLER LEVELERS AND BULL BLOCKS

the density and hardness of the work." This means that gauge is not the only determining factor; the softer the metal, the thicker it can be, and still be stitched.

Materials become work hardened in such operations as forming, Prout cautions, and this will reduce the optimum thickness of metal which can be stitched.

No exact specifications have been established; they vary from application to application. Says Prout: "If you think your product comes close to being stitchable, give us a sample and let us see what we can do with it."

As A Guide . . .

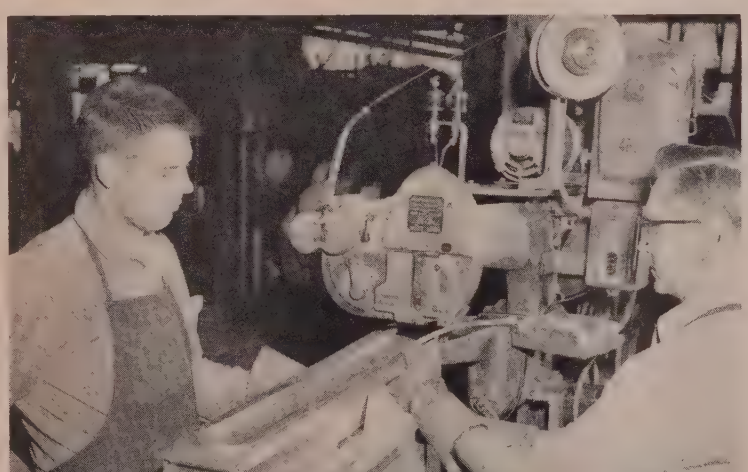
Some specifications, determined for various materials, can be used as a guide.

When stitching two sheets of 2024 alloy in the annealed (-0) condition, sheet thickness must not exceed .084-inch, composite thickness .160-inch. Maximum sheet thickness of 2024-T3 should be .051, composite thickness .080; in the T36 temper, top sheet thickness is .051, composite thickness .070.

Two .093-inch thick pieces of 1100-0 aluminum can be stitched together, as can two .062-inch thick extrusions. Other possibilities: One piece of 1100-0 (.125-inch thick) aluminum, an extrusion (.093-inch thick), or a piece of 2024-T4 (.064-inch thick) aluminum can be stitched to one piece of ⅛-inch phenolic, 3/16-inch plastic, ¼-inch sheet asbestos, solid rubber or tempered masonite, ⅜-inch leather, standard masonite or wood, or ½-inch sheet cork, fibre or sponge rubber.

In stitching phenolics or plastics, make sure the materials are soft enough for the wire to penetrate without cracking the work.

When attaching aluminum to wood, send the stitch first through the metal, then through the wood. Avoid stitching through wood more than ⅜-inch thick; the grain structure may cause legs to wander and miss the clinching die. This problem is more acute with soft woods than with hard woods, so sometimes wood thicker than ⅜-inch can be successfully stitched.



CASE HISTORY:
Stitching Liners for Home Freezers

Stitching machines supplied by Acme Steel Co., Chicago, have helped Amana Refrigeration Inc., Amana, Iowa, up production speeds of freezer liners by 12 times. The firm was using 25 screws to secure liner components, but could only handle about five assemblies an hour. By using stitching, 60 liners are processed in the same time. Procedure: Back of liner is stitched to bottom assembly; top assembly is taken from conveyor and stitched to liner; bottom assembly is then stitched to liner, and completed unit conveyed to station where it is placed in freezer casing. Liners are .040 stucco embossed aluminum and are stitched with 18-gauge zinc-coated wire. Two men work this phase of production; have turned out as many as 650 liners in a 9 hour shift.

There are significant differences between stapling, stitching, and tacking. Stapling uses a pre-formed staple similar to those in simple office machines. Stitching utilizes coils of wire from which a piece is snipped to size, formed into a staple, then forced through the metal and clinched—all in 1/5 of a second.

Tacking, rarely used on metal, is a stitching or stapling operation in which the legs of the staple are not clinched.

Stitch Types

The two basic stitches are standard loop and flat (see Figure 1). Both have a 7/16-inch crown size (distance between inside of legs of formed stitch, regardless of wire size).

Standard loop stitches are formed when the legs of the staple are clinched in a bowed fashion on the metal's underside. Flat stitches penetrate the metal and then the legs are slapped flush against the metal. Loop stitches are fast, but not as strong as flat stitches.

The standard loop stitch is formed by a small arm and a stationary die. This clinching mechanism permits maximum maneuverability in confined spaces, so the standard loop is used approximately 95% of the time. Normally, this stitch is used on non-structural applications in which metals and non-metallics are joined to thin metal sections. It has a load strength equal to 1/3 that of a ⅛-inch rivet.

The standard loop stitch has two variations: The by-pass loop, in which the legs cross one another when clinched; the outside loop in which legs curl apart in clinching, but remain buried in the material. The by-pass is excellent for joining rods, small tubes and springs to metal pieces. The outside loop, though rarely used, is applied when it is desirable to keep the stitch imbedded in non-metallic work. Crown size of both stitches is ¼-inch.

Flat stitches are popular for aluminum applications; are approximately 25% stronger than loops; stand up well to vibrations; have seen wide use in aircraft manufacture. Their drawback is that they can't be used in combined thicknesses exceeding ¼-inch.

This thickness limitation is due to the clinching method, which utilizes close-tolerance guide-ways and a moving die which folds legs against the material with a swift upward blow. In stitching heavy thicknesses, the legs tend to wander and miss the guide-ways.

Stitching Systems

Both types of stitches can be banged into lapped materials in a parallel, longitudinal or diagonal pattern (see Figure 1).

The parallel system pleases produc-

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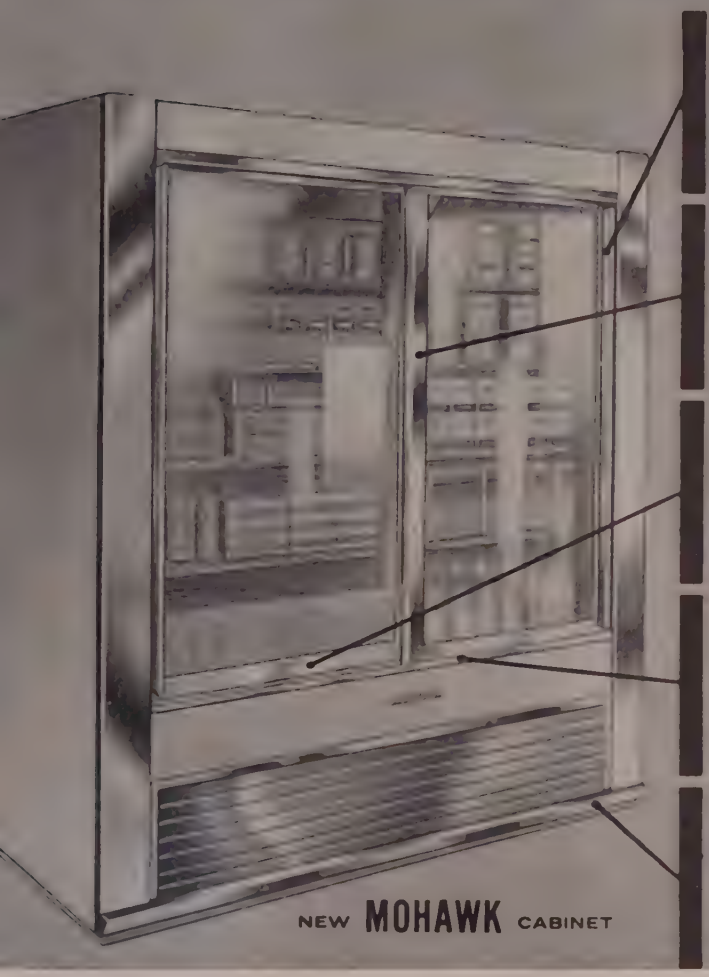

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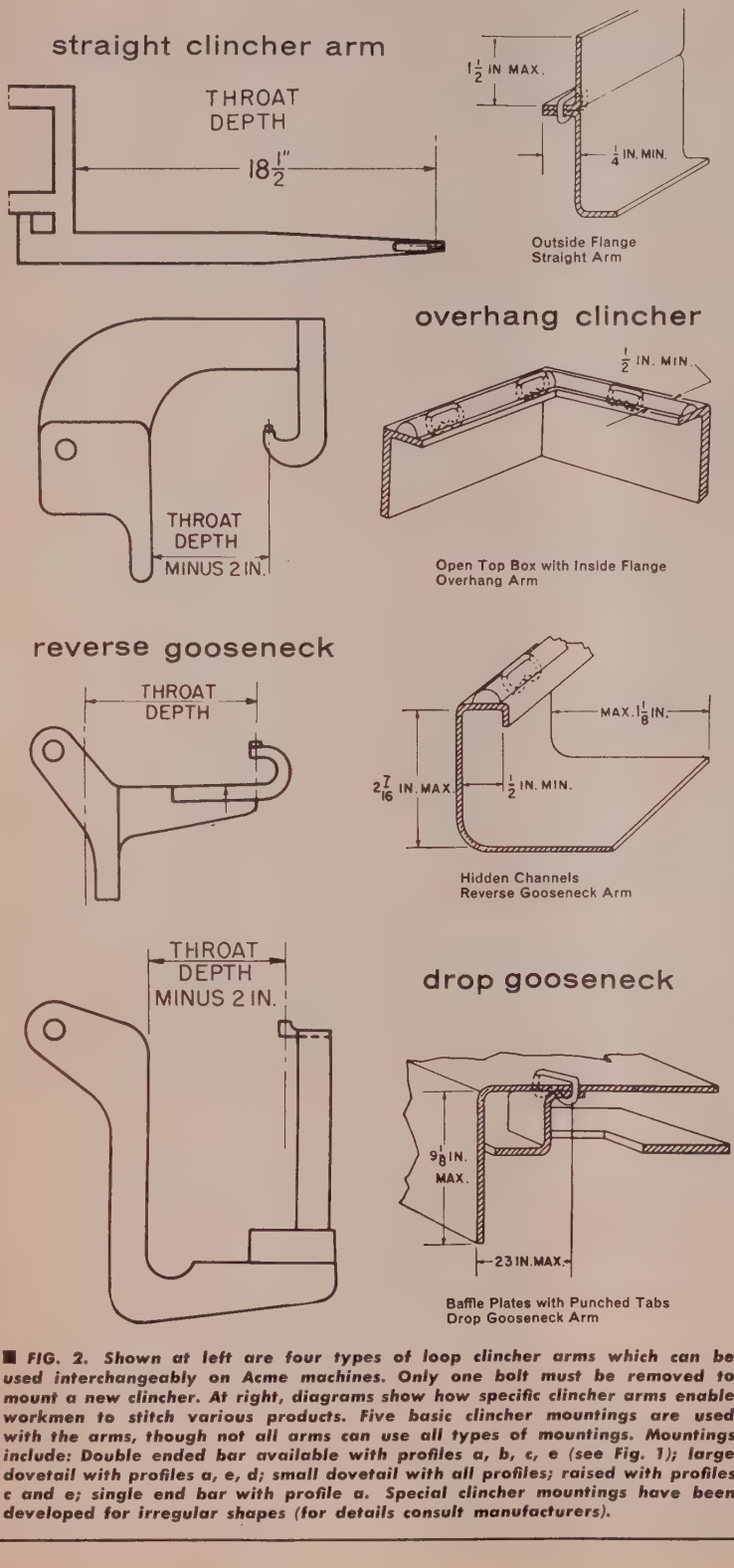
LOOP CLINCHER ARMS and TYPICAL STITCHED SECTIONS



■ ***FIG. 2. Shown at left are four types of loop clincher arms which can be used interchangeably on Acme machines. Only one bolt must be removed to mount a new clincher. At right, diagrams show how specific clincher arms enable workmen to stitch various products. Five basic clincher mountings are used with the arms, though not all arms can use all types of mountings. Mountings include: Double ended bar available with profiles a, b, c, e (see Fig. 1); large dovetail with profiles a, e, d; small dovetail with all profiles; raised with profiles c and e; single end bar with profile a. Special clincher mountings have been developed for irregular shapes (for details consult manufacturers).***

tion men most because it causes the least interference between metal and tools when feeding work. It is usually specified for close-to-shoulder work because of its ease of application. But the stitches run parallel to the metal's direction of shear, thus producing joints weaker than those of longitudinal or diagonal patterns.

Strong Stitching Patterns

In the longitudinal system, stitches are stretched out lengthwise, in a line which cuts across shear direction. This makes stronger joints than parallel stitches.

The diagonal system produces maximum strength. Since stitches are placed on a diagonal to shear, they offer coverage both parallel and perpendicular to shear direction.

Stitched panels equal or exceed the fatigue strength of riveted panels. Reason: As the wire staple is forced through the work, each leg punches out a tiny plug equal to wire diameter. When a rivet is used, much more parent metal is removed. In highly stressed structures, narrow spacing must be avoided to minimize wire perforations. The limit is 1-inch.

Wire

Stitching wire should be ductile enough to be clinched without breaking or cracking at corners, yet strong enough to push its way through the work and hold it together securely.

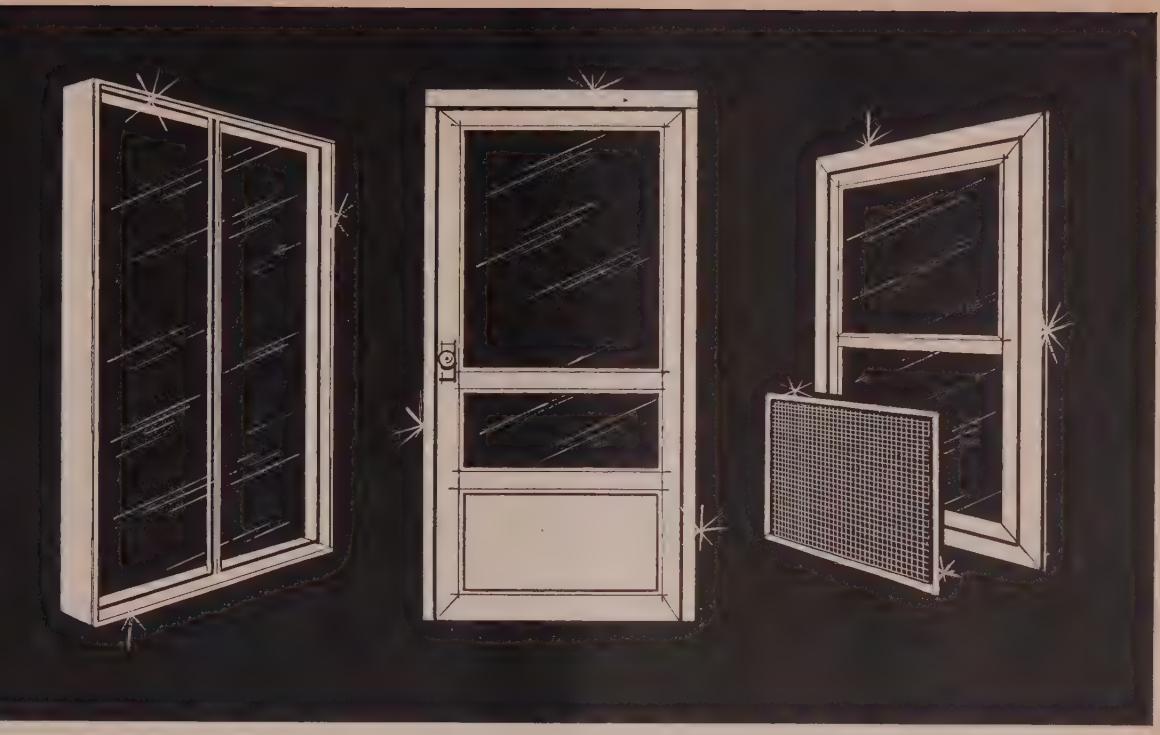
Wire comes in four tensile strength ranges: 220,000 to 249,000 psi; 250,000 to 289,000 psi; 290,000 to 319,000 psi; 320,000 to 360,000 psi. All grades are available either tinned, galvanized, bright finished or with a liquor coating (a light copper wash).

For high strength applications, the recommended wire is 18-gauge AISI grade C 1086 steel with a tensile strength of 290,000 to 330,000 psi. It can withstand cold bending through 180° flat on itself without cracking. When used on aluminum, the wire is supplied with a .0015-inch zinc coating to prevent galvanic corrosion.

If stitches must withstand high temperature use, stainless steel wire with a tensile strength of 240,000 to 265,000 psi should be used. For other special applications the following wires are supplied: 18-gauge phospher bronze; 18-gauge AISI 302 corrosion resistant steel, copper, brass or monel.

Approximately 98% of all the wire used is .0475 inch diameter (18-gauge on Washburn and Moen steel wire gauge), with 16-gauge (.0625-inch diam.) and 20-gauge (.0348-inch diam.) being used at other times.

The commonly used 18-gauge high carbon wire costs 20 to 25 cents per thousand stitches. Stainless steel wire



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costs about five times as much. Wire is supplied in 10-pound coils.

Metal stitching machines for making loop stitches come in stationary models and semi-portable models which must be mounted on overhead tracks. All flat stitching machines are stationary.

Machine Costs

Loop clinch and flat clinch stitchers cost between $1000 and $2500. Loop clinch stitchers are inexpensive to maintain, but not the flat clinch units which require constant attention so the close tolerance of the clinching mechanism is preserved.

All units are powered by fractional horsepower motors ranging from 1/3 to ½ hp; they punch out 80 to 100 production stitches a minute. Machine capacity is ¾-inch, though only some combinations reaching this thickness can be stitched.

Pedestal type stitchers have foot switches which can be moved about so the operator can change his position when required. Specially ordered loop-clinch models can operate on their side or upside-down. Flat clinch stitchers are available with stationary clinchers for making loop clinches.

To stitch, the operator merely steps on the foot switch. The machine take over, producing a series of lightnin like movements culminating in a com plete stitch.

First, wire comes off the coil, through feed wheels, into a feed tube and up to the cutting die. A length of wire i then fed into a mandrel and is snipped off so it has flat, burr-free ends an sharp edges.

Forming the Stitch

The mandrel, holding the cut-to length wire, then moves back into th machine under grooved forming legs These formers move down wrappin the length of wire around the mandre in a U-shape. The mandrel then re tracts to the front of the machine t get another piece of wire.

Next, a shoe moves up from the rea of the machine to the spot vacated b the mandrel. The shoe supports the in side of the legs and crown, while th formers support the outside of the leg A driver in close tolerance to the d mensions of the stitch crown move down to support its outside.

The driver and forming legs the move down toward the work while th shoe slowly edges out from under th stitch. Just as the formers touch the wor and clamp it tightly, the shoe slips com pletely out from under the stitch, clea ing its path.

The stitch then punches its wa through the work, meets the clinchin die, and curls into position (in loo stitching) while the crown is force against the metal's surface. In fla clinching the protruding legs are m by an upward moving clincher whic smacks them flush to the work.

Product Limitations

The machine mechanism requires de inite space, and therefore imposes si and shape limitations on articles to b stitched. To make stitchers as versati as possible, manufacturers have deve oped interchangeable clincher arm several types of machines, variou clincher mountings for specific and i regular shapes, and units with varyin throat depths (distance from clinch die to pedestal). Also, various types loop stitch clincher profiles are ava able (see Fig. 1).

Interchangeable arms for loop stitc ers are termed straight, reverse goos neck, overhang, and drop goosene (see Fig. 2). Flat stitchers have straig arms and posts.

The Acme catalog pictures a standa stitcher with a straight solid arm four throat depths: 8, 20, 25 and 4 inch. Another unit with a straight ar and head turned 90° comes with a 2 inch throat. The semi-portable ur has a 5-inch throat, the two types flat stitchers have 25-inch throats.

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Modern Metals' series on fastening aluminum will be reprinted in a single booklet this spring. Subjects covered will include:

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PART 2: Riveting: Advantages; types of rivets; selection of alloy, diameter, length; preparing rivet holes; driven head types; tools and drivers; machine riveting (see page 28). Stitching: Advantages; case histories; stitchable materials; explanation of terms; types of stitches; stitching patterns; wire; machines (see page 40).

PART 3: How to select and use threaded fasteners in manufacturing aluminum products.

PART 4: When, where and how to use special fasteners, including special rivets, inserts, pins, spring stop nuts, interference stop nuts, blind screws, quick release and wedge type fasteners, etc.

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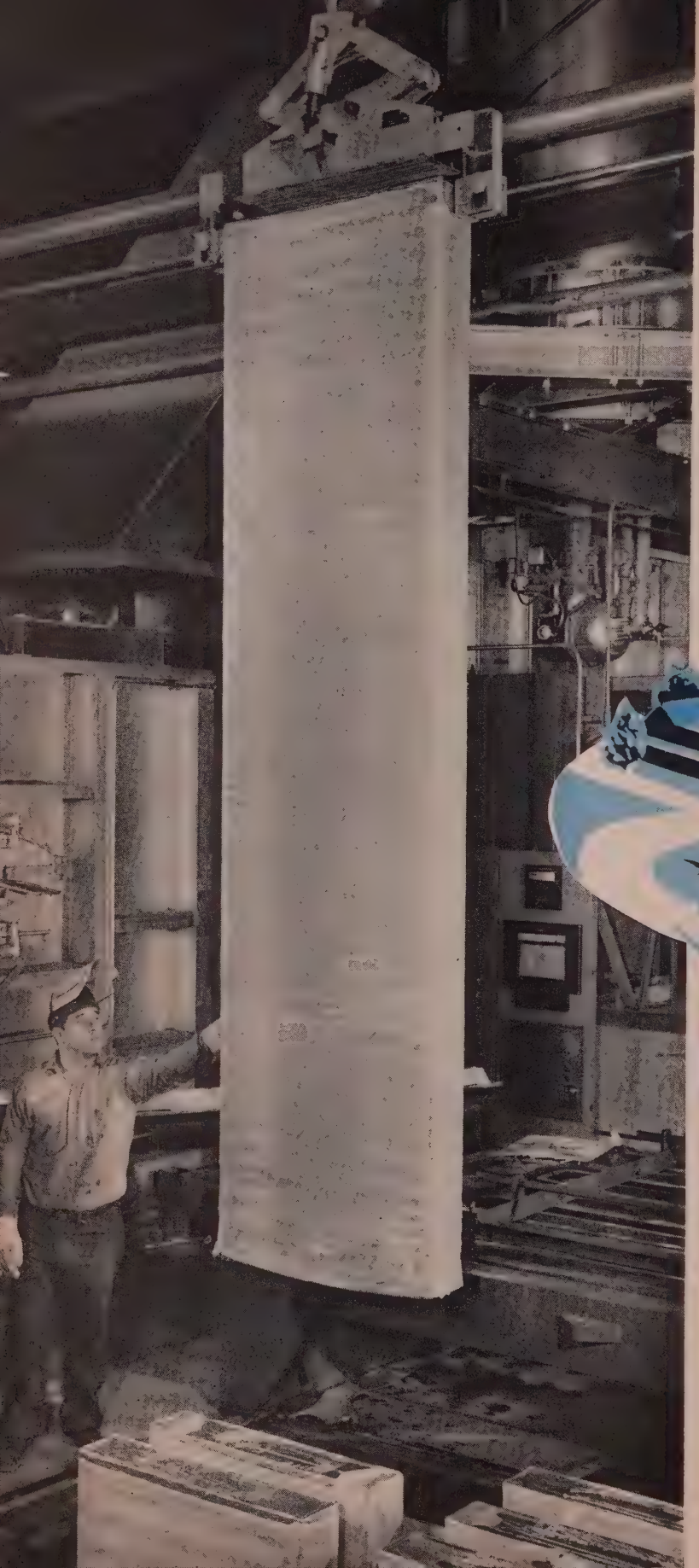

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Magnesium Panels, Castings Help Boost Speed At Indianapolis '500'

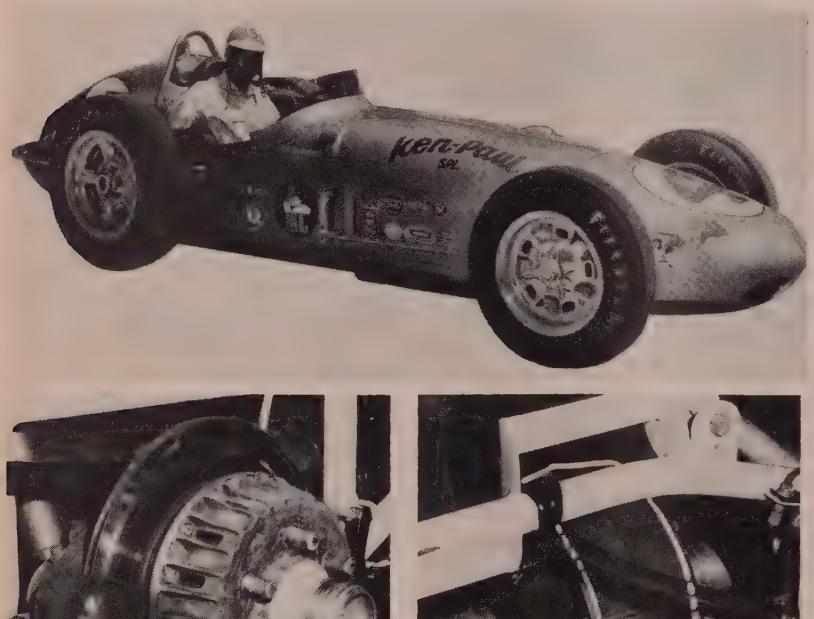
WHIZZING around the Indianapolis Speedway on magnesium wheels is nothing new to racing drivers, but in the past few years this light metal has become more prominent in racing car bodies and other components.

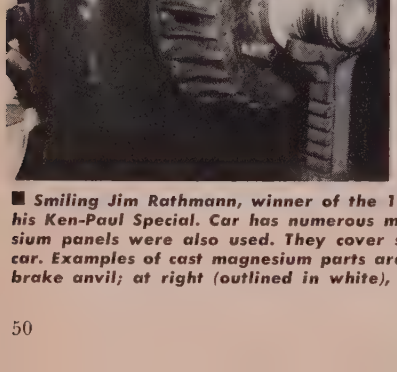
It all started in 1956 when mechanic-builder A. J. Watson brought the John Zink Special to the Memorial Day 500-mile race. Watson's car, clad in magnesium sheet and plate, won both the pole position and the race.

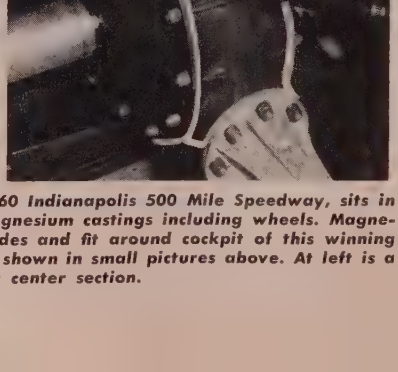
Since then magnesium body panels have become more widely used. Of the 33 entries in the 1959 race, 10 used mag body panels. In 1960, 14 cars had magnesium body panels. Most outstanding of the users was the winner—the Ken-Paul Special driven by Jim Rathmann. Reportedly, more mag-clad racers than ever will enter this year's '500'.

Magnesium panels are combined with fiberglass in constructing racing car bodies, and are also frequently used as underpannings and firewalls, according to a survey by Dow Metal Products Co., Midland, Mich.

Six of the first 10 finishers in 1960 used magnesium extensively—not only for body construction but as vital mechanical parts. Included in this group, in addition to the winner, was the second place Leader Car Special, 1959 winner driven by Rodger Ward.







■ *Smiling Jim Rathmann, winner of the 1960 Indianapolis 500 Mile Speedway, sits in his Ken-Paul Special. Car has numerous magnesium castings including wheels. Magnesium panels were also used. They cover sides and fit around cockpit of this winning car. Examples of cast magnesium parts are shown in small pictures above. At left is a brake anvil; at right (outlined in white), a center section.*

Another car with a lot of mag Travelon Trailer Special driven by Ji Hurtubise—set a new one-lap record c 149.601 mph and a four-lap mark c 149.056, in qualifying. (An interestin sidelight is that A. J. Watson built c sold the blueprints for all three car named—Ken-Paul, Leader, Travelon.)

All cars in the Indianapolis race hav used magnesium wheels for the pas several years. They are sand cast an though only slightly lighter than wir wheels they are more rugged and les expensive.

Halibrand Engineering Co., Culve City, Calif., manufactures several hun dred racing car parts of magnesium Sand cast parts are molded for the firm by Osbrink Mfg. Co., Los Angeles.

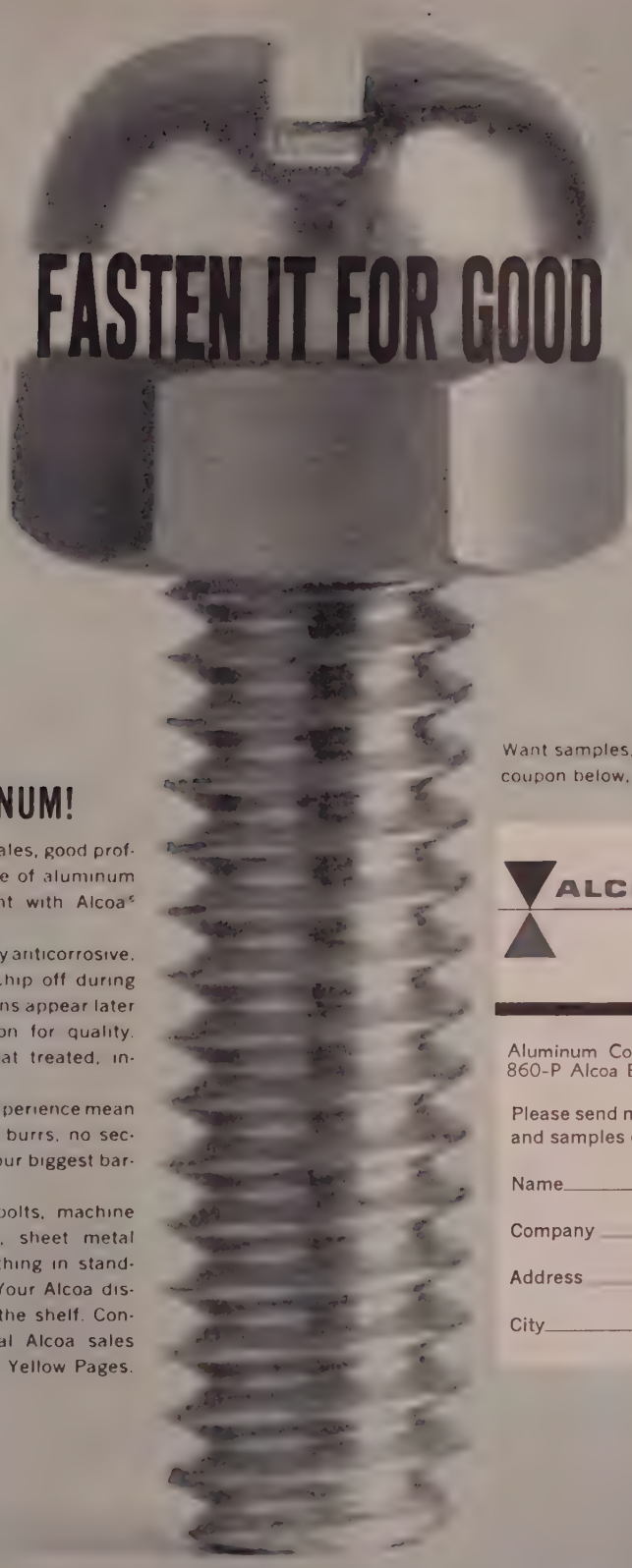
"We try to make everything we ca of magnesium," says owner Ted Hali brand. In producing a magnesium rac ing car component, Halibrand is mainl interested in saving weight withou sacrificing strength. He feels that mag nesium fits these requirements and tha commercial auto makers will soon re alize this and use more of the metal

Halibrand uses the stock car con verted for racing to point up magne sium's light weight. He says a car using cast magnesium parts weighs 100 pounds less than if parts were cast of aluminum

Magnesium disc brakes designed by Halibrand have stood up under the severest conditions of high-speed track racing. The brake unit features a mag nesium housing, wheel discs and master cylinder. Advantages are light weight and fast heat dissipation. Many of this year's models will have this type brake.

Up front, last year, some of the cars used spindles and hubs of forged mag nesium alloy, and mag steering hous ings. And some quick-change pin drive hubs had magnesium pressure plates.

One of the largest castings in the racing car is the center section (this is sometimes called the differential hous ing, though race cars have no differen tial). In the 1960 running, more than 75% of the racers had this part made of magnesium. Two recent winners had mag center sections, as did the record-setting Travelon.



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BIG DOME shades sea show

Gold anodized structure shields audience from sizzling Florida sun at Miami Seaquarium. It stands 57 feet high, spans 145-foot diameter, weighs only 45,000 pounds. Erection detailed.

← Donald Richter, design engineer of Kaiser Aluminum & Chemical Sales, shows how struts and panels are bolted to cast aluminum gussets in assembly of the dome.

A HUGE, gleaming, gold anodized aluminum dome now shelters the thousands of tourists who congregate at the Miami Seaquarium to watch the antics of porpoises, sea lions and other sea-going animals. Unlike its 12 predecessors—other geodesic domes that have been erected in such diverse areas as Moscow and Hawaii—this huge half-shell is not intended to keep out the weather. It merely protects audiences from the fierce Florida sun.

This version of the lightest roof ever built by man consists of diamond-shaped creased aluminum panels attached to a sturdy framework of struts fabricated from quarter-inch thick aluminum. The struts are bolted together, back to back, panels sandwiched between them.

The struts are bolted to cast aluminum hubs to create a hexagonal pattern. Sunlight shining through the cracks between the panels and glinting on the gold-anodized aluminum creates a dramatic effect. The panels are omitted over the stage where the marine animals perform, and are used only in the section that covers the audience.

The vast half shell stands 57 feet high, is 145 feet in diameter, and weighs only 45,000 pounds. It is so light that the engineers found it would tend to lift in high winds if it were not tied down securely. Thus, design of the foundation became more a problem of weighting the roof down than holding it up.

The 25 dome shoes are bolted to a serpentine concrete girder 4 feet wide and 10 inches thick. This rests on 25 reinforced concrete columns which stand a minimum of 10 feet above the ground. They, in turn, rise from buried foundation that is a ribbon c reinforced concrete 2 feet thick and feet wide.

The foundation is covered with minimum of 4 feet of earth, so that th weight of the earth anchors the dom

Two cranes with booms 150 feet lon were used to raise the dome as it wa assembled. Assembly proceeded from th center out. It was hung from pendan lines fastened to keyed castings from carriage supported by the crane cables

Floating up as row after row of panel and struts were added, the structur was kept under control at all times b means of guy wires and structural tubu lar towers around the perimeter.

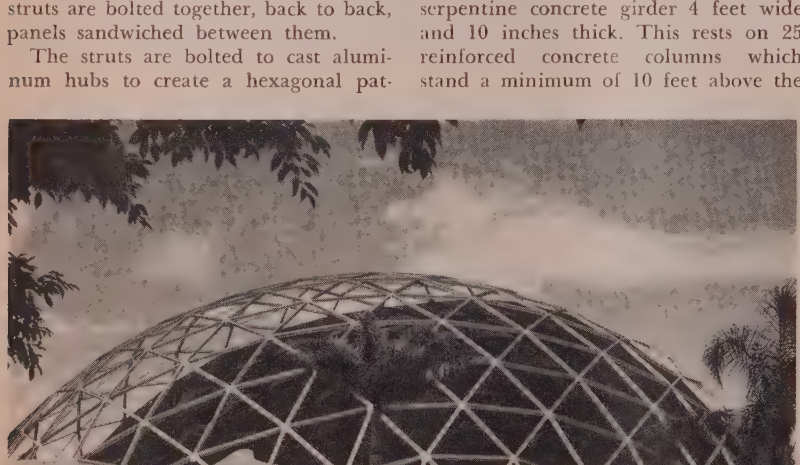
Since there was very little room fo error in fastening the dome shoes t the anchor bolts which had been cas in the supporting beam, the complete dome was a triumph of precision fabr cation.

The huge roof has numerous virtues It calls attention to the Seaquarium it needs no maintenance; acoustica treatment was not necessary because o the many voids; and there is no ventila tion problem since both the southeas and northwest sections of the dom were cut away for ventilation.

It is the most inexpensive dome tha can be built, according to Domes, Inc fabricator-erector, under franchise fro Kaiser Aluminum & Chemical Corp.

The dome was the first major im provement at the Miami Seaquarium since Wometco Enterprises, Inc., ac quired control of the huge marine ex hibition early this year and announce its intention of making it Florida's to tourist attraction.

Designer of the dome was Kaise Aluminum and Chemical Sales, Inc. architect was Charles McKirahan, wit Herbert M. Schwartz of the Miami firm of Rader and Associates as consultin engineer.



■ *New landmark in Florida's Dade County area is this gold anodized aluminum dome, recently erected over the Miami Seaquarium's sea show arena.*

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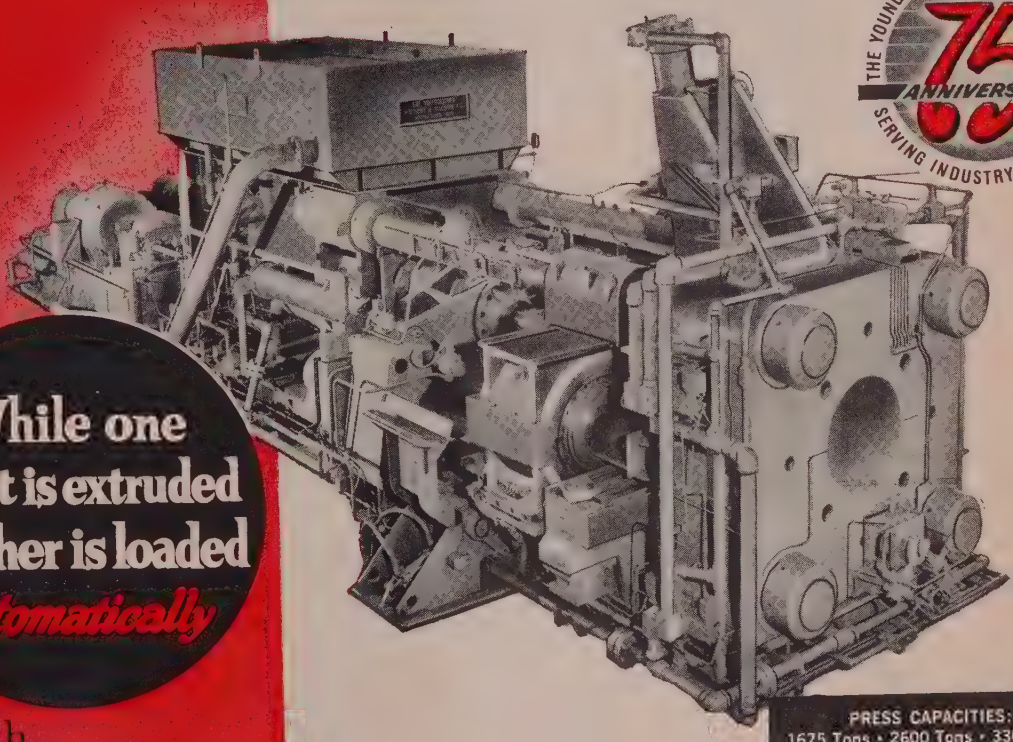

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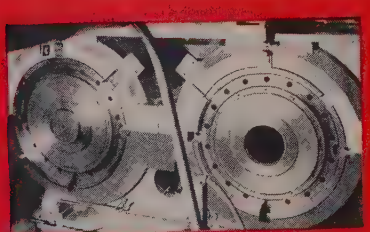

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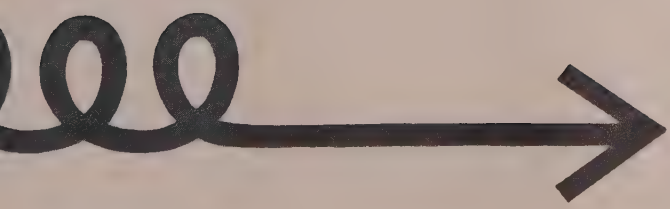

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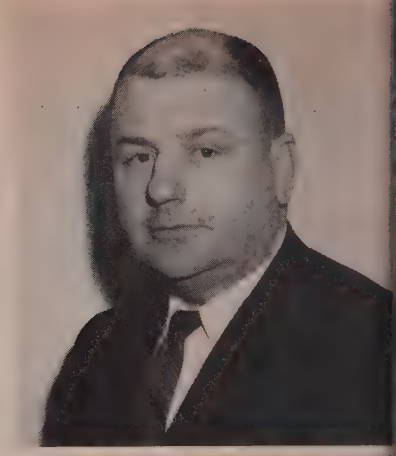
What's Needed To Produce Bright Drawn Aluminum Tube

by *Vern G. Gerschutz, Technical Service Director*
Kerns United Corporation, Chicago



SALES appeal inherent in bright finish drawn aluminum tubing provided the incentive for manufacturers to solve production problems as quickly as possible. That they are now achieving uniformly high quality at reasonable costs is proof that cooperation between manufacturers and suppliers of materials can pay large dividends.

The Technical Service Department of Kerns United Corp., suppliers of industrial lubricants, worked with several tube manufacturers throughout the development stages to supply the best possible lubricants and establish control of application. This program was so successful that if sub-standard brightness occurs, the cause almost inevitably lies in die practices or incoming quality and not the lubrication.

Development work was carried out with 1063 aluminum alloy bright finish tube of 1-inch diameter x .034-inch wall thickness. Other sizes are being produced using the same tooling techniques.

Practices used in producing bright finish tube may vary slightly to accommodate different sizes of blooms or physical properties. However, the salient controls of high standard brightness are in the following practices.

In producing hot drawn tube bloom, the surface condition must be of the best structure and the wall thickness as uniform as good practices will allow.

But even the best surface can be ruined when reduced cold in the breakdown passes. Rough or torn surface or orange peel often occurs if reductions are too great (generally limited to 40% to 45%), if the tooling setup is not correct, or if improper lubrication is applied. The breakdown passes must preserve a satisfactory surface since only a limited depth of orange peel will burnish out during the finish draw.

A very viscous oil is the best breakdown lubricant. It sustains the highest ranges of reductions when used properly. Liberal quantities are applied to both the inside and outside of the tubing. The ideal oil re-circulation system keeps the oil as cool as possible (80° to 100°F), but satisfactory results were obtained when the oil reached 140° on one installation where the pump proved unable to handle cooler oil.

The all-important finishing draw is set up somewhat differently in various shops to obtain the bright finish. The most successful and commonly used method employs a burnishing die, set between the front and back dies, and designed to reduce the wall thickness .0015-inch.

A ½-inch piece of circular tool steel of the exact outside diameter as the front and back dies can be drilled and then ground with a 1/16-inch radius. This is intended to come in contact with the tubing, so clearance toward the delivery side must be allowed. The inside dimension of the burnishing die at the 1/16-inch radius is determined by location of this die, amount of taper in the plug, and wall thickness of the finished tube.

Used in conjunction with the burnishing die is an oil-grooved spacer, about ½-inch thick and having several oil holes drilled from its outside to the inside diameter. This spacer prevents oil from building up pressure at the burnishing die. An oil outlet must be provided in the die holder.

Die setups at the finishing draw bench vary from shop to shop. The following lubrication procedure for this operation has been found to produce optimum results with all die setups:

Provide an oil recirculating system with a minimum tank capacity of 75 gallons. The tank should be equipped with separate coils to heat or cool the oil while in use. The oil feed (¼-inch stream) should be applied to the top of the tube at a point two to four inches preceding entrance into the back die. It is not necessary to lubricate the inside diameter since oil carryover from the breakdown passes provides sufficient lubrication to this wall.

Before loading the recirculating system, preliminary testing on 6-foot lengths of tube should be performed. This allows the viscosity to be adjusted for best results. Less viscous oil or kerosene can be used for thinning.

The short lengths of tube are hand swabbed with oil, then drawn. Once satisfactory results are obtained, several pieces should be drawn while pouring oil over the tube in a steady stream simulating the recirculating feed. Further thinning may be indicated.

Once adjusted, performance will be maintained by the recirculating application. The tanks can be loaded and production runs initiated. A special drawing oil gives excellent results on this application and has been enthusiastically accepted by the manufacturers.

Several other operating practices have been recognized as necessary in achieving the best brightness.

Die materials, in order of preference, are carboloy, chrome plate, and plain tool steel. Orange peel can usually be traced to the size relationship of the front to the back die in the breakdown draws, or to the dies having too sharp a blend of the opening angle to the bearing surface.

At the finishing bench, the back die (entry) dimension can be varied until the best results are attained by the burnishing die. Too large a back die will cause scarfing and pickup and eventual breakage of the tube.

Most of the brightening is accomplished by the burnishing die, but sometimes can be improved by sharpening the angle between the lead and bearing surfaces of the front die. Dull gray streaking on one side of the tube indicates uneven working. Straight drawing is essential to eliminate this streaking. Bright drawn tubing cannot be subjected to straightening operations.

The costly development problems in producing bright finish drawn aluminum tubing have been surmounted. This up-to-date process is ready for manufacturers desiring to put fresh sales appeal into their products.

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Welding Aluminum

Part 10: Quality Control

Two phases of quality control are covered here: Inspection and testing of welded joints; weld faults, their causes and probable corrective measures. This 11-part series will be concluded next month with a discussion of mechanical properties of welds.

Based on information supplied by Aluminium Laboratories Limited, Research Division of Aluminium Limited

ASSURANCE that weldors, equipment and procedures will combine to produce code-satisfying welds and a guarantee that quality welds will be maintained throughout production are positive benefits of a quality control program.

In preparing such a program, remember that as quality requirements rise, costs rise. This means that the service specifications of a particular job must be pin-pointed so that welds of adequate quality will be produced at the lowest possible cost.

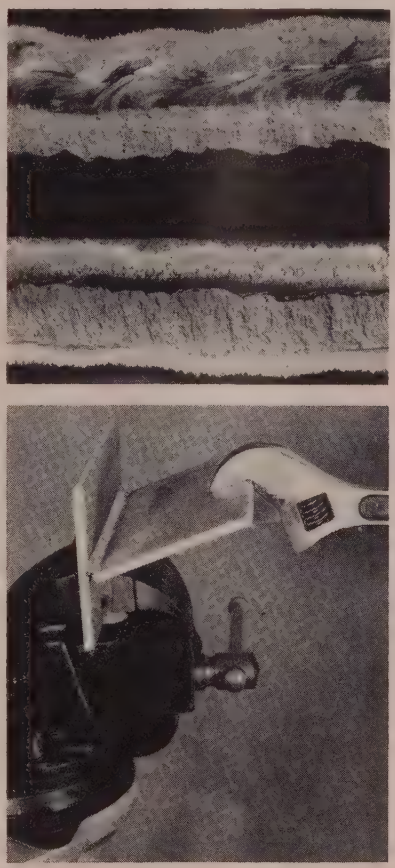
There are three main aspects of quality control. The first deals with weldor and procedure qualification, supervision, standards and specifications, and was carefully covered earlier (see MM, Part 9, Welding Aluminum, Jan. '61, p. 72). To be covered here: Inspection and testing of welded joints; and weld faults, their definition, causes and probable corrective measures.

In discussing inspection and testing methods, we will stick to those that represent good commercial practice, because specific standards vary with end products. These methods are important because they assist weldors in making, and inspectors in assessing, quality welded and brazed joints.

Testing methods are classified as either non-destructive or destructive.

Non-destructive methods, which do not require destroying the weld or assembly, include: Visual, radiographic and ultrasonic examination, and the use of fluorescent and dye penetrants. Occasionally, trepanning is used to obtain samples for metallographic examination.

Visual examination, either with or without a low magnification lens, is used first to determine weld quality. Careful evaluation of a weldment surface will give a good indication of its quality, particularly when this information is combined with that obtained by other inspection methods.



■ ***FIG. 1. Fillet-welded sample is clamped for fracture test. Weld will be broken by bending piece in wrench upward. Top shows close-up of fractured fillet weld.***

Visually, you can detect defects such as non-uniformity of appearance, incomplete penetration, surface cracks, under-cutting, over hanging, sagging and run-offs. Non-uniform appearance is, strictly speaking, not a defect. But a non-uniform weld bead is a tip-off that the weld was not made properly and that defects may exist.

Radiographic examination determines the presence and nature of defects or other structural discontinuities inside the weld. The equipment is relatively expensive and requires trained personnel for operation and interpretation. However, use this method wherever the quality or quantity of the work justifies the expense.

The reliability of radiographic examination is increased by taking radiographs of the weld from two different angles; or by using it in conjunction with other testing methods. Also, use a penetrameter in all radiographs to indicate sensitivity.

Radiographic examination will reveal the following defects in addition to most of those listed under visual examination: Porosity, inclusions, internal cracks, cold-shuts, incomplete fusion and incomplete penetration.

Fluorescent and dye penetrants locate surface cracks, surface porosity, and incomplete fusion which extends to the surface. A water-soluble penetrant having high fluorescence or dye content is applied to the weld area, and quickly finds its way into extremely small surface openings. Excess penetrant is rinsed off thoroughly with water, the weld is dried, and developer is applied and allowed to cure.

With penetrant dyes the defects show up in color under ordinary light. With fluorescent penetrants it is necessary to

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use an ultra-violet lamp to reveal defects.

In ultrasonic testing, ultrasonic vibrations are passed through the material and an oscilloscope is used to measure the time the reflected vibrations take to reach the receiver or return to the transmitting and receiving head.

FIG. 2. Steps in fracture testing butt welds. Top to bottom: Specimen is notched, clamped solidly with weld close to vice teeth, then broken. Close-up shows fracture.

It is more difficult to differentiate between the various weld faults with this method than with radiographic examination. Consequently, ultrasonic testing is used primarily to check the soundness of a weld rather than to determine the nature of faults.

Further development is necessary before ultrasonic testing can become a standard tool for the inspection of aluminum weldments. However, a combination of ultrasonic and radiographic examination is an excellent means of non-destructive testing.

In destructive testing the weld or assembly is cut or broken to provide a specimen for examination. However, in cases where the assembly is large or where the loss of one unit would be serious, it is common to test a sample weld prepared from the same materials and welded in the same manner and position as that used in actual production.

Destructive testing methods find their widest application in the qualification of processes, procedures, weldors, and materials rather than in the testing of finished products. They include fracture, bend, tensile and hardness testing, as well as metallographic examination. When used, these tests are carried out at regular intervals, with frequency increasing when other tests indicate defective welding.

Fracture testing is effective and economical for checking general weld quality. It can be carried out readily in the shop, and should be part of the operator's daily routine.

To fracture test fillet welds, weld only one side, then break the specimen by bending the upright plate over the weld (see Fig. 1).

For testing butt welds the specimen is notched, solidly clamped, then broken. The fracture is examined for defects such as porosity, inclusions, incomplete penetration, incomplete fusion, and underbead cracking (see Fig. 2).

Bend testing is an efficient and economical way to assess the quality and ductility of a butt weld. Weld defects such as porosity, incomplete fusion, crater cracks, internal cracks and incomplete penetration can be detected. This should be used in conjunction with the fracture test, since both can be carried out readily in the shop.

Use a fully guided bend test so the specimen is bent progressively. Thus, bending occurs in the weld which might not be the case in a free or semi-guided bend test (see Fig. 3).

Width of the bend test specimen is not critical. But for maximum consistency of results the width should be 4T (where T is thickness of material bent) and the length a minimum of 8 inches. For routine testing and for the qualification of procedures and weldors, a 1-inch wide bend test specimen is usually used.

If plate thickness exceeds capacity of bend testing equipment, side bend tests can be made instead of face and root bend tests. A test specimen of full plate thickness and width within the capacity of the bend testing equipment is used (in this case T is width of specimen).

The standard specimen for a side bend test is square in cross section, with edges machined or filed smooth with a 1/16-inch radius on the corners. The weld is then dressed flush with the parent metal. Special care must be taken so transverse marks and scratches are not left on the sample.

The prepared specimen is then bent through 180° around a center pin by a roll attached to the handle of the fixture. A pin passing through the specimen prevents it from slipping.

When testing welds on 1100 and 3003 aluminum alloy that have been made with 1100 or 5056 filler wire, radius should be 2T. If 4043 filler was used, radius should be 4T. To test welds in 5052 and 6061 alloys, use a 4T radius if 4043 filler was used, a 2T radius if 5056 filler was used.

Pin Distance

The distance of the pin from the center of the weld is a function of the bend radius and will vary with the type of bending equipment used. It should be placed so that the weld is in the center of the bend. And the distance between the center pin and the moving roll should be equal to the thickness of the material being tested.

A satisfactory weld should withstand face, root, and side bends of 180° around the radii given, without developing a fracture more than 1/8-inch long.

Tensile testing determines the strength of welded and brazed joints, and also reveals the same defects as fracture testing. It is not employed extensively in production work, but is used in the testing of processes and procedures.

Specimens should be prepared and tested in accordance with American Welding Society and American Society for Testing Materials recommendations. The specimens are pulled to destruction to determine tensile and yield strength, and elongation.

Hardness testing may be used to determine the extent of the heat-affected zone on either side of the weld. Standard hardness testing machines such as Brinell, Rockwell or Vickers are used.

Metallographic examination is an effective method of determining the struc-

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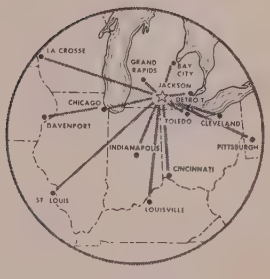

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ture and quality of welded and brazed joints, but it requires trained personnel and special equipment. It is used mainly in the investigation of welding processes and procedures and in assessing defects spotted by other tests.

Metallographic examination is divided into macro and micro-examination. Macro-examination consists of looking at a prepared specimen either with the naked eye or through a magnifying glass no more powerful than X20. In micro-examination the specimen is viewed through a microscope having a magnification not less than X20.

In macro-examination the sample weld is sectioned in places where quality checks are desired. The samples are cut at right angles to the line of the joint and slightly to one side of the center of the area to be examined. They are then filed or machined smooth.

Visual examination will reveal the geometry and structure of the weldment as well as reasonably large defects, such as porosity, incomplete penetration, incomplete fusion, cracks, and undercutting. Etching the specimen in a 10% solution of caustic soda shows the structure and defects more clearly.

Specimens for micro-examination are prepared in the same way as for macro-examination except that the surface to be examined must be ground and polished to a high finish. Examination of polished specimens will show the geometry of the weldment, large and small defects (cracks and inclusions). To reveal the grain size and structure, as well as the size and shape of the weld and heat affected zone, the specimens may be etched in a suitable solution.

Weld Faults

Faults in aluminum welds occur when proven procedures or techniques for preparation of materials and/or for welding aren't followed. Major faults encountered when welding aluminum include: Cracks, incomplete penetration, incomplete fusion, undercutting, and porosity.

Cracks (crater, longitudinal and underbead — including root cracks) are fissures which occur in the as-weld area during solidification and cooling.

Crater cracks—which occur during solidification of the molten puddle after the welding arc is broken — are usually quite small, but serious, since they may act as stress risers if the assembly is highly stressed. They are particularly serious when they occur at the end of a joint.

To avoid crater cracks be sure to use the proper filler alloy and be sure you are manipulating the torch and filler correctly in laying the bead.

If crater cracks do occur, the unsound metal must be chipped out and that portion of the assembly rewelded.

Longitudinal or bead cracks are rare in aluminum welds. They result from: Incorrect filler alloy, low welding speeds, improper edge preparation, inadequate joint spacing, or lack of compression. High stresses imposed during welding may cause a crack if the weld bead is too small. Close attention to welding procedure, especially edge preparation, spacing, filler alloy, and size of weld will prevent longitudinal cracks.

■ *FIG. 3. Fully-guided bend test of butt weld. Square in cross section weld has been filed smooth and mounted. Note pin which keeps specimen from slipping in subsequent bend stages. Close-up shows bent weld.*

Underbead cracks may occur when fillet welds are made in 6061 parent alloy with 5056 filler at arc speeds exceeding 20 ipm. The tendency to underbead cracking is not usually encountered in manual welding, but can become a serious problem when machine welding.

To avoid underbead cracking, keep welding speed under 20 ipm, use 4043 filler, if applicable, and change fillet size. If the problem still occurs, it may be necessary to redesign the assembly to either avoid fillet joint or switch parent alloy.

Weld Penetration Vital

Incomplete penetration means the weld does not penetrate the full thickness of the parent metal when welding from one side; or the welds do not interpenetrate sufficiently when welding from both sides. It is serious since it acts as a point of stress concentration which may initiate a major failure.

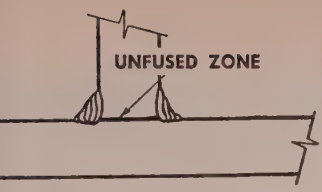
In butt welds, incomplete penetration is usually the result of low weld currents, insufficient joint spacing, improper edge preparation, or excessive welding speeds for the currents employed. Correct these and adequate penetration will be achieved.

In fillet welds complete penetration is obtained when the weld penetrates both members to a depth sufficient to ensure fusion at the root. In Tee joints the presence of an unfused zone between the two fillet welds does not necessarily constitute incomplete penetration (see Figure 4). Causes of incomplete penetration in fillet welds: Low welding current, excessive welding speed for the current employed, and incorrect welding process for the alloys involved.

Incomplete fusion occurs when the filler does not fuse to the parent metal or parent metal to parent metal. Major cause of this fault in aluminum welds is the incomplete removal of the oxide film during welding. Either the parent material was not cleaned sufficiently, or not enough flux was used, or the action of the arc in the inert gas shielded arc processes was faulty, probably due to low current.

Close adherence to preweld cleaning, joint spacing and welding procedures should prevent the occurrence of this defect. The conditions giving rise to this defect must be understood since the defect is difficult to detect by non-destructive testing methods.

Undercutting is a groove in the par



. 4. Example of unfused portion in int which does not represent in-ete weld penetration.

etal along either or both sides of eld bead; is serious since it reduces oss sectional area at the joint and ct as a stress riser. Improper torch ulation, incorrect torch angle, ex-e welding currents or slow welding s cause undercutting.

osity, not a serious problem in num welding, is the presence of gas pockets or voids in the weld the parent metal adjacent to the

is well established that a small nt of porosity, scattered uniformly ghout the weld, has little or no nce on the strength of the joint. ver, if porosity is present in any amount, the joint is weakened. e major cause of porosity is foreign r — water vapor, oil, grease, etc. h gets into the weld puddle and ken down into gases by the intense of the arc or flame. Such contami-may come from poor quality filler or filler which has been improp-andled and stored. Poorly cleaned t metal can also contribute con-ants to the puddle.

sity Important, But . . .

h solidification rates, such as with welding, result in more porosity slow solidification rates, especially welding in the flat position. Slow ication may permit gas to escape surface without being entrapped. nely high solidification rates may in micro-porosity; the gases hav-nsufficient time to coalesce into es of visible size.

se attention to the cleanliness of arent and filler metals and adher-to proper procedures and manip-n will prevent this defect.

detailed discussions of welding ques, filler alloy selection, edge ration and other areas of welding , if not applied correctly cause faults, check the following seg-of this Welding Aluminum series: t 2, TIG Welding (June '60, p. art 3, MIG Welding (July '60, p. Part 5, Resistance Welding (Sept. 70); Part 6, Oxy-Gas and Metal Welding (Oct. '60, p. 66); Part 8, nd Post-Welding Operations (Dec. 38). Also see Table 1, Recom-ed Filler Alloys, in Part 2.

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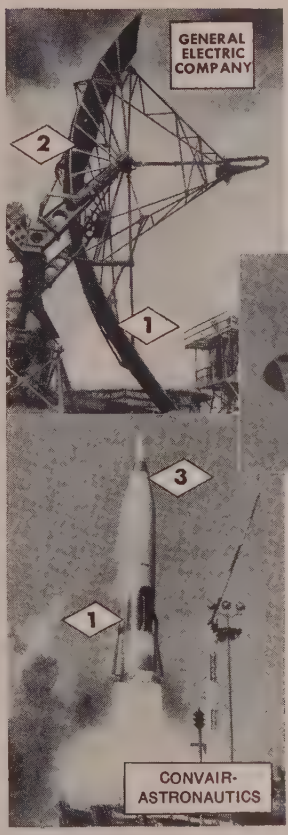

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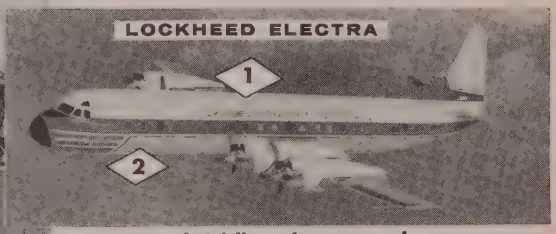

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Alodine contributes its protective qualities to Colorweld's amazing paint performance.

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Write for Bulletin 1424C, gives detailed technical specifications on different Alodine chemicals available for pre-treating aluminum.

Growing Housewares Industry Uses Increasing Quantities of Aluminum Every Year

by H. K. Darby
Associate Editor

THE 1961 Housewares Show, held last month at Chicago's new McCormick Place, had 909 manufacturer exhibitors who used the equivalent of some 2700 standard size trade show booths to demonstrate their products. From almost any viewpoint the show was a success.

This was the new exhibition hall's first trade show, and the facilities were subjected to considerable strain. While the main show floor alone comprised the biggest housewares display ever held under one roof, more than 200 exhibitors still had to use meeting rooms and a large promenade area on the lower level.

The term "housewares" embraces a multitude of disparate products to begin with, so no one seemed greatly perturbed over displays of lawn mowers, portable electric tools and camp stoves spotted among more prosaic lines of cooking utensils, bathroom accessories and sun lamps. Regardless of the lines shown, sales executives' reactions were noticeably enthusiastic over the volume of business written there.

Salesmen Have Ideas

Equally apparent was the salesmen's knowledge of aluminum and its application to their products. Their comments served to point up the metal's strong and weak points in a variety of products.

Push-button portable electric clothes washers, made for the past 30 years by Naxon Utilities Corp., Chicago, are equipped with agitators made up of three shapes extending from an upright steel center post. These butterfly shaped parts are stamped out of polished aluminum, almost ⅛-inch thick except for an integral bead around the edges to maintain rigidity and give greater protection to fabrics.

"Our first agitator was an aluminum casting," Naxon's Arnold Micon said. "Its faults included poor treatment of delicate fabrics and rather high cost. Next, we used Bakelite for the part. We switched back to aluminum because we are metalworkers essentially, wanted to make as many components as we could in our own plant, and reckoned that sheet aluminum was cheaper than Bakelite."

Naxon also uses heavy-gauge, formed aluminum sheet for the drainboard of this washer.

McGraw-Edison Co.'s Bersted Division, Booneville, Mo., introduced two new electric saws at the show. The new 7-inch model, PH 1055 is described as "a rugged, all ball bearing, heavy duty saw designed for professional and amateur alike." The full 7-inch blade has a saw arbor speed of 5000 rpm. This model and a new 6¼-inch saw have die cast aluminum housings.

McGraw-Edison's Model 72100 motor driven sander has a die cast housing fastened to a polished steel skirt. An aluminum die casting will replace this steel component soon because there is a noticeable difference in color.

McGraw-Edison fabricates aluminum for a wide range of electric home appliances which are made in five firm plants. The company had a highly satisfactory year in 1960, and expects to do as well or better in '61.

Kromex Corp., Cleveland, manufacturer of buffet and pantryware, also showed a line of aluminum lawn torches which they had introduced last July. Several versions of this item were displayed at the show. Basically they have spun or drawn aluminum bodies, or lamp, set on a painted iron pipe. Higher priced models stand on a four-piece e truded aluminum rod, the bottom s tion of which is swedged to a sha taper for easier insertion in the groun

"The torches have been a real sleeper assistant sales manager Alan Gary sai "They've turned out to be very pop lar. Most filling stations in suburb localities stock the special fuel, a ker sene base with citronella, which giv the open flame a nice odor and a as an insect repellent to some degree

Gary likes the multiple sales featu of the lawn torch. Householders almo invariably buy four or five of them a time. Four models are priced betwee $3.95 and $7.95.

The Kromex line of torches carri the Alcoa label. "Alcoa was a big he in this promotion," Gary said. "As f as our entire operation is concerne aluminum is the predominant materi in our manufacturing."

The Kromex man said that 1960 bu ness was good and that the Housewar Show gave his company a fine start its '61 sales activities.

For the P. B. R. Mfg. Co., Philade phia, makers of steel and aluminu folding tables, the Houseware Sho was a harbinger of better sales ahe after a somewhat disappointing 196 "It has been a good show for us," man at the P.B.R. booth said.

(*Continued on page* 68)

■ ***These picnic items are housewares because buyers requested their presence at t Housewares Show. The Coleman Co.'s new camp stove has .027-inch aluminum cas causing it to weigh one-third less than the regular steel stove. The small ice box for station wagon use; has embossed aluminum wraparound.***

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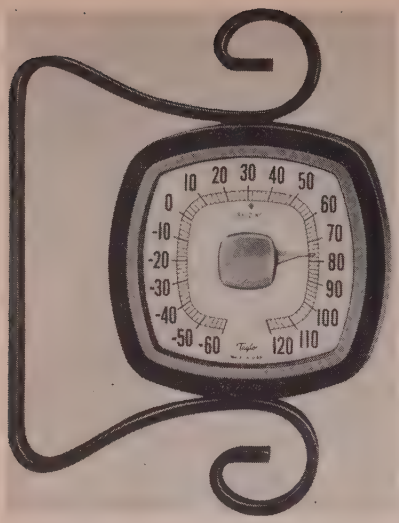


■ *The bracket for this Taylor window thermometer, Model 5346 is ⅛-inch thick by ½-inch wide painted aluminum.*

P.B.R.'s Aluma-Fold tables are offered in a choice of two surfaces—smooth or leather grain. They measure 2½ feet wide by five and six feet lengths, and 2 x 5 feet.

Dormeyer Corp. is a heavy user of aluminum. For instance, the liners of the Model DF-1-CH "Fri-Well" and the DF-2-BU deep-Fry cooker are solid cast aluminum. The cooker is circular and has a polished aluminum wrapper, used above a painted cast steel base. The attractive satin finish is done for Dormeyer by Aluminum Specialties Co., Manitowoc, Wis.

The Dormeyer coffee makers are mainly mechanically buffed aluminum, though one model is chrome on aluminum (cold chromed), while another is stainless steel. One version of this stainless model uses 24 karat gold plating for base, handle and top band.

"We introduced a stainless line after some of our sales people complained that the giftwares market demanded something like this," a Dormeyer executive said. "It has proved to be a pretty slow-moving item."

So slow-moving, in fact, that Dormeyer isn't making them anymore. Even the plain stainless steel model with black trim is priced out of the gift market at $30, because manufacturing costs are so high.

"It's hard to deep-draw stainless," the Dormeyer man said, "so we made the body by rolling a blank and then heliarc welding it closed. Then, we also had to weld in a bottom. The spout had to be made in two halves and *these* had to be welded.

"Buffing added to the cost, and when you figure two pounds of stainless per unit at 73 cents a pound or thereabouts, you have a total metalworking cost of more than $3.50 per unit. This compares with about $1.30 for the aluminum models."

Other Dormeyer small electrical appliances use aluminum forgings—as in the case of the electric skillets, in two sizes—and a deep fry sauce pan. A large grill that can cook 15 hamburgers at one time is an aluminum casting. However, few if any of these basic manufacturing operations are performed at Dormeyer; Aluminum Specialties and other job fabricators do this work.

Plastic Because . . .

The remarks of I. G. Cates. president of Lincoln Metal Products Corp., Brooklyn, N. Y., were a hint as to why plastics can be such a strong competitor of aluminum in the high-volume pantryware market.

"We used to make an aluminum liner for a round step-on can but now we use polyethylene because it is a molded product and therefore seamless, easier to clean," Cates said. "We still use aluminum in our square 20-quart step-on can, but would change to polyethylene if the mold weren't so expensive."

Cates indicated that the aluminum liner for this large can will go just as soon as a higher sales volume for this item will justify purchase of the mold for plastic.

Cates' only other use of aluminum is the lid on a 17-quart round step-on can. This is a polished job, and the Lincoln Metal executive believes it rivals chrome plating for luster. Trouble is, he pointed out, the polish doesn't last as long as the plating job.

Lincoln Metal Products experimented with copper-tone anodizing for some products, but dropped it. "Anodizing never quite makes that copper color," Cates said.

A more positive complaint about color anodizing performance came fr a representative of the Taylor Inst ment Co., Rochester, N .Y., makers thermometers and other recording struments for the past 90 years. Tay had been using a black anodize on a minum window thermometer brack to simulate wrought iron. A Tay salesman reported that the brack turned green within a relatively sh exposure period, forcing the compa to change to a painted finish.

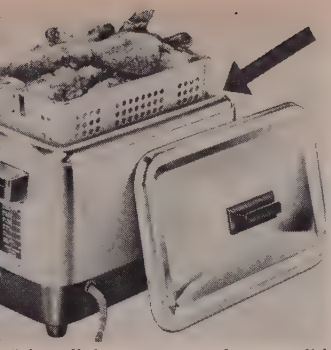
"All of our portable appliances substantial quantities of aluminu was the statement of an executive Lasko Metal Products Co., Westchest Pa. "We are one of the few fan ma facturers who use nothing but a minum for fan blades. We put m pitch on them, and get more air livery."

In the fabricating stages, Lasko p ple appreciate the lighter weight aluminum coil stock compared w

■ *Naxon Utilities Corp.'s portable automatic clothes washer has a three-piece aluminum agitator, stamped from polished metal. Drainboards for wringers in other models are also heavy-gauge stamped aluminum.*

■ *West Bend Aluminum Co. calls this fu automatic percolator its Golden Anniv sary Special. In polished aluminum it tails at $9.99; in gold anodized alumin the price is $12.99.*

■ *These lawn torches are guaranteed add flair to the suburbanite's patio pa The lamp is spun or drawn; rod is fo piece aluminum or one-piece painted pipe. Kromex Corp. of Cleveland, maker, likes their multiple sales feat*



Fri-Well by Dormeyer has a solid luminum liner. The company is a user of aluminum in all types of appliances.

and their ability to gain fan rigidity with deep embossed ribs. o Industries, Inc., Rochester, uses aluminum in grilles of port- eaters. Reflectors are highly pol- aluminum.

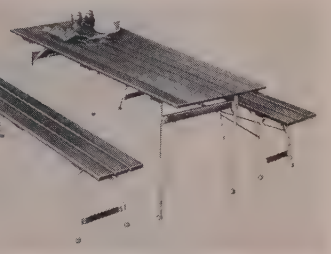
o Industries, Inc., Rochester, cents a pound, cold rolled steel l to turn down," a salesman said. id that business was slow for his ast year.

epresentative of Berns Air King said. "95% of all of our fan are aluminum."

kscraft Co., Reedsburg, Wis., re- greatly increased consumption of num in their vaporizers, food rs and other nursery appliances, son of product line expansion and r volume. Mirro Aluminum Co., owoc, and Leyse Aluminum Co., nee, Wis., do most of the Hanks- manufacturing.

nall icebox, upright in design yet enough for station wagon trans- is a new product of The Cole- Co., Inc., Wichita, Kan. The prod- atures a one-piece embossed alu- n wrap-around. It's called the Sta- Vagon Cooler. A Coleman repre- ve said that station wagon travel wing and that this handy picnic nce has become an excellent

ther new Coleman product that luminum is a gasoline pressure stove, the first of its type made



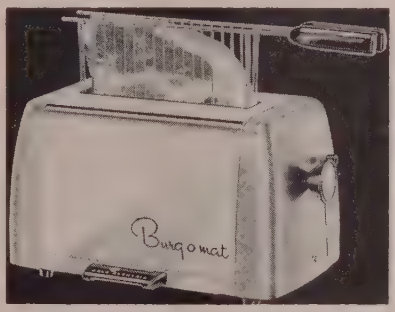
Luminum Products, Philadelphia, this Barbecue Set, part of its 1961 -Fold line of outdoor furniture. uction is 1-inch aluminum tube and od slats, completely stained and for weather protection.

by this specialist in outdoor cooking appliances. The Coleman salesman said that aluminum will find increasing application in future products planned by the company.

The Black & Decker Mfg. Co., Towson, Md., maintains its lead in the portable electric tool business. "We've had continual growth," a B&D executive said. "Last year's business was 20% better than '59's."

The B&D man said that the company was redressing its market practice by keeping its products away from discount houses and selling only through bona fide wholesalers.

Here's the way the portable tool market was shared last year, according to this informant: B&D grossed $50 million; Skil and Porter Cable each did $25 million, while the 32 other manufacturers in the business grossed a total of $50 million.



■ ***Thin steaks or burgers are cooked like slices of toast on the Burgomat. Maker, Cole Electric Mfg. Co., Mansfield, Ohio, reports that outer ends are coppertone anodized aluminum. The timer is an aluminum impact extrusion. Center shell is chrome steel. Drip pan is 3003 aluminum.***

Close to 150 manufacturers at the show claimed to use aluminum in some quantity and, if the light metal's growth in this industry can be measured by the enthusiasm for it which was generally encountered at McCormick Place, even more aluminum products will be in evidence at the show next year.

Meanwhile, the National Housewares Manufacturers Association prepares to grapple with the problems of a growing list of applicants for the 1962 Show.

"We accept exhibitors on a first-come-first-served basis," said NHMA's Franklin R. Ullrey. He explained that invariably some companies are refused admittance to the show, but that the list of topflight manufacturers was growing very fast. What's more, it is the nation's buyers who decide what should be classed as housewares when they request that various products, power lawn mowers, for instance, be exhibited.

"Nobody envisioned the overflow that we had," Ullrey said, "But if some exhibitors were dissatisfied, I don't know of anybody backing out of the 1962 Show."

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If your slitting requirements call for coil widths from 12" to 60", in gauges from .015" to .250", the economy of purchasing Yoder Slitting Machinery can be yours. Operating a Yoder Slitting Line only one eight-hour shift per week, for example, could easily produce 35 tons of slit strands per week...or 1,820 tons every 52 weeks. At a slitting cost saving of only ½¢ per pound, the annual savings would amount to $18,200.

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Aluminum and Steel Producers

COURT CAN MAKERS AND USERS

At the Canners Convention

MANUFACTURERS and users of cans were ardently courted by the steel and aluminum industries at the canners convention, held last month in Chicago. The joint meetings of the National Canners Association and the Canning Machinery & Supplies Association was well covered by boosters of the two rival materials.

As the opponents squared off for another round, canners and can makers in attendance sat back assured that they will reap the most benefit from this fierce battle; that the result will be better cans, cheaper cans, cheaper-to-ship cans — regardless of who wins.

Not in attendance were the ultimate consumers who, packers claim, have the final say in what containers are made of. Instead, clad in slim pants and bulky sweaters the housewives were strolling supermarket aisles unaware of their role in the struggle.

A cautious optimism was apparent in the booths of producers of both aluminum and steel. Aluminum men were slightly smug over recent gains in the citrus market, but not too boastful since the estimated 700 to 800 million aluminum cans to be shipped to this field will be but a small fraction of the 23.9 billion containers used last year to pack some 1200 foods.

Count On 'Thin Tin'

Steel people were confident that they will protect their huge market, especially with the advent of new "thin tins." Nevertheless, they were obviously smarting over the sudden surge of citrus canners to aluminum (see MM, Jan. '61, p. 84). It looked obvious to most observers that almost this entire field will be aluminum's within a few years.

One point made often by aluminum spokesmen is that they are not after the entire can market; that aluminum isn't suited to pack every commodity. All the producers want is for canners to use aluminum for those products which are actually preserved better in it.

So far, aluminum has been most successful in getting itself used for 6-ounce citrus concentrate cans, and 1-quart oil cans. For 1961, similar success is expected with fish and potted meats, which together were packed in 3.8 billion cans last year.

In looking to the future, Reynolds Metals Co. says that "barring unforeseen obstacles, we expect the tuna fish industry to convert to aluminum in 1962 for the standard half-pound cans." For this switch, Reynolds has developed a shallow drawn seamless can.

Must Make 'em Faster

A dilemma for aluminum has been speeding up can-making methods to be competitive with tinplate. Fabrication processes include impact extruding; drawing and ironing; deep and shallow drawing requiring no ironing; and conventional 3-piece can procedures — forming a body from a blank, cementing the side seam, and attaching separate ends.

Conventional 3-piece cans can be made of aluminum at the same speeds as tin, as long as the seam is cemented. But welded side seam tin cans are produced at a much faster rate. So far, welding has not been successfully adapted to aluminum cans. With some can making processes, tin units are made at an 800-a-minute clip.

What will be the fastest and best aluminimum can-making method? Informed persons say it's impossible to predict now, since developmental work still has a long way to go. But some qualified comments were made.

B. E. Meyer, manager of the can machinery division of E. W. Bliss Co., Canton, Ohio, said his firm has developed machinery which will impact extrude cans (at 120 cans/min.), fabricate them from three pieces, or draw them (at 240 cans/min.).

Bliss did this, says Meyer, because "We feel aluminum is the coming can material, so we want to have machinery available for whatever can-making method will produce the best containers."

According to Meyer, one of the more promising manufacturing methods is shallow and deep drawing, especially if speeds can reach 400 or more cans a minute. Agreeing with the bright prospects for this process was Arthur McAlpin, Reynolds' assistant general director of packaging research.

John C. Kosky, of Baldwin-Lima-Hamilton Corp., Philadelphia, predicted "aluminum will make its greatest inroads when impact extrusion methods work at speeds competitive with tin plate."

Cliff Sands, Alcoa's rigid container manager, was cautious in his remarks. But he did say that impact extruding and shallow and deep drawing would become more attractive when higher speeds are attained.

Sands also cited the obvious — that 3-piece can manufacture, as used in oil and juice containers, is the method that got aluminum moving with high-volume can orders. (There is some uncertainty about the actual speed of making 3-piece aluminum cans. Rates of 450 to 650 a minute have been claimed, but a machinery manufacturer spokesman scoffs at this, saying 425 is tops.)

But Is It Profitable?

The profitability of the commodity price of can sheet was another area examined. Existing belief was that primary producers took a price whipping while trying to gain stature in the can business; that profits were slim in supplying sheet at 32.2 cents a pound.

Paul Dearborn, Reynolds' director of food packaging markets, refuted this. "The sale of sheet for can making is a distinctly profitable operation," he asserted.

Alcoa's Cliff Sands didn't contradict this, but indicated that much work was needed before current prices could really help the financial statements of the producers. "If we are going to stay in the can industry," he remarked, "we must compete with current metals on an equitable basis."

Sands explained that all operations — from primary metal production to shipping of sheet — must be geared so that colossal amounts of can stock will be produced with no lost motion, no wasted expense.

Such efficiency would give aluminum a more equitable starting point from which to compete with tinplate, which has already gained such production smoothness.

How TO WELD ALUMINUM...

This series of MODERN METALS reports on welding aluminum will be reprinted. This manual will cover the following topics:

WELDING PROCESSES—Characteristics and relative merits of 10 methods are outlined.

TIG WELDING—equipment needed; selection of gas, filler alloy; torch manipulation; adjusting current; etc.

MIG WELDING—applications; equipment; filler alloy; adjusting arc; torch manipulation; trouble shooting.

MIG vs. TIG—relative cost, versatility, weld quality, etc. of these two main aluminum welding processes.

RESISTANCE WELDING—types of machines, electrodes, cleaning methods, etc. for spot, seam, flash welding.

OXY-GAS & METAL ARC METHODS—how to choose flux, filler etc.; jigging; flame control; current control, etc.

BRAZING—when and how to use torch, dip and furnace brazing on aluminum.

PRE- AND POST-WELD OPERATIONS—full details on joint design; cleaning, etc.

SUPERVISION AND SAFETY—how to train and supervise your welding personnel.

QUALITY CONTROL—how to obtain optimum weld quality. **(See article, page 58, this issue.)**

MECHANICAL PROPERTIES—of aluminum welds.

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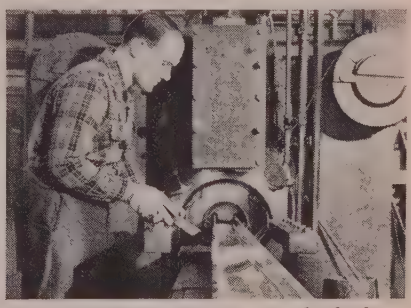

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News Products and People

Cerro Corp. Buys United Pacific Aluminum

Cerro Corp., for many years a leading producer and fabricator of copper and brass and a producer of aluminum sheet, has taken a major step toward full integration in aluminum production by its acquisition earlier this month of United Pacific Aluminum Corp. of Los Angeles. The move, which was approved by United Pacific's stockholders February 7th, promises to make Cerro the aluminum industry's seventh primary producer, with facilities in operation in the Pacific Northwest within the next two years.

Cerro, formerly Cerro de Pasco Corp., already competes in the aluminum sheet market through its wholly owned sheet rolling subsidiary, Fairmont Aluminum Co., Fairmont, W. Va. Late last year Cerro made its first move toward integrated production of aluminum when it joined forces with Bridgeport Brass Co., Scovill Mfg. Co. and Aluminium Limited to produce reroll sheet cooperatively (MM, November, '60).

United Pacific's price was 100,000 shares of Cerro stock which went to UPA stockholders at an exchange rate of one Cerro share for every 4.77 UP shares (the company's outstandin shares as of January 12th, 1961 nu bered 477,405). Cerro's stock had a average value of 34½ in the first we of February. In its last full fiscal yea UPA had sales of $7.6 million whi netted the firm a little more than $30 000.

United Pacific Aluminum started u in 1940 under another name and h become a leading producer of painte aluminum sheet. While it isn't to b doubted that Cerro will make effectiv use of these facilities, UPA's main attra tions were its land options and a co tract for a large block of electric powe a must for any company who has primary production plant in its sights.

As of this writing many questio related to Cerro's acquisition rema unanswered; however, there has bee some evidence that the big copper co pany intends eventually to compe vigorously in all aluminum market As one member of the industry i the Chicago area put it: "I doubt th Cerro Corp. will take halfway measures

Reynolds' Big New Hot Line Starts Up at Sheffield

What is billed as the "world's widest aluminum coiled sheet and plate" now is being mass produced on a complete new "hot line" at the Alloys Plant of Reynolds Metals Co. in Sheffield, Ala.

Both the 170-inch wide reversing mill which heads up the new line, and the four-stand 120-inch continuous stri mill at the other end are the widest al minum rolling mills in the world, a cording to D. H. Hipp, plant manage

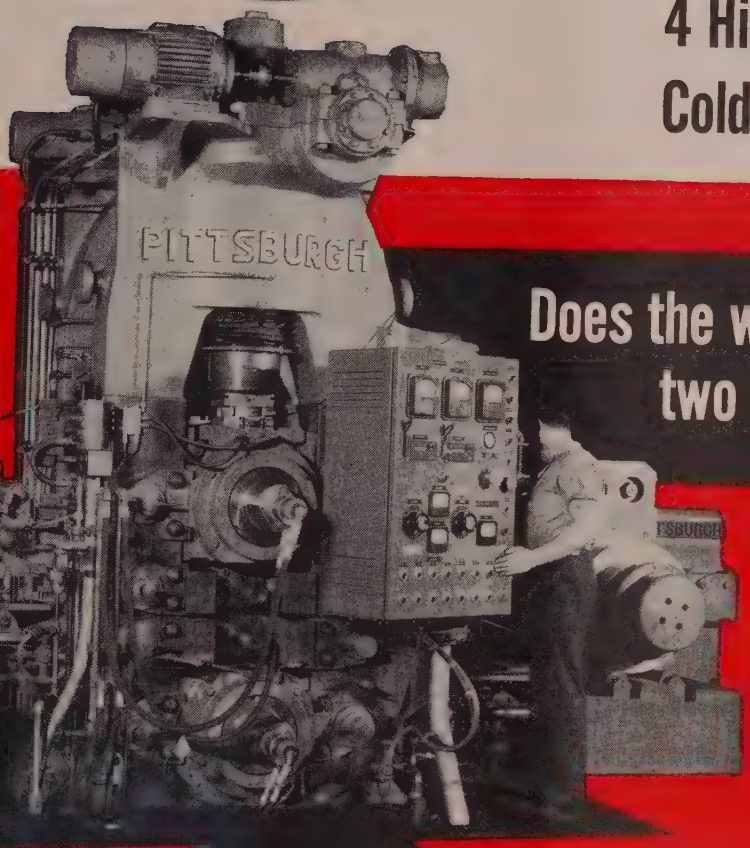
"Between the 170-inch and the 12 inch mills is a 130-inch-wide reversin mill for increased production efficiency Hipp said. The 170-inch mill can pr duce plate up to 165 inches wide an the 120-inch strip mill can produce coi up to 115 inches wide before trimmin he said. The plant has a 112-inch col mill for further rolling of wide coi off the hot line if the customer so spec fies.

Reynolds said the new line is capab of producing coils weighing up to 30,00 pounds and almost seven feet in dia eter to meet the growing demand fo larger coils. United Engineering Foundry Co., Pittsburgh built the thre mills to Reynolds specifications.

David P. Reynolds, executive vi president of the company, pointed ou that wide sheet permits trailer man facturers to consider "wrapping" th sides and front of an entire trailer wit a single wide sheet of aluminum an top the trailer with another single wi sheet. Formerly trailer manufacture found it necessary to rivet or we smaller sheets together. The wide she reduces fastening and fabricating cos and decreases the possibility of leakag Reynolds said.

PITTSBURGH

Combination 4 High/2 High Cold Mill . . .



Does the work of two separate mills

"Precision" and "Versatility" are the words that best describe the new combination 2 High/4 High Cold Mill designed and built by PITTSBURGH to secure precision gauge, temper and finish for the ferrous and non-ferrous industries. As a 4 High Mill, it is used for cold reducing; as a 2 High Mill, it is used to acquire the desired temper and finish. Several desirable design features are incorporated to keep roll change time to a minimum. Low initial cost and economical operation are attractive plus values.

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Our plant is equipped with a superior complement of well diversified machine tools that are available on a continuing basis for economical machining of heavy castings or the manufacture of auxiliary rolling mill equipment, such as heavy mill tables, furnace pushers, slab depilers, downcoilers, ingot buggies, slab transfers, etc.

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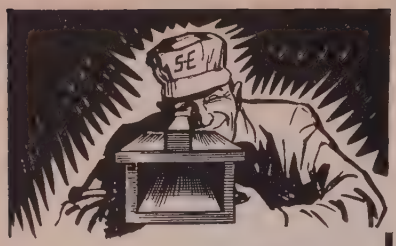

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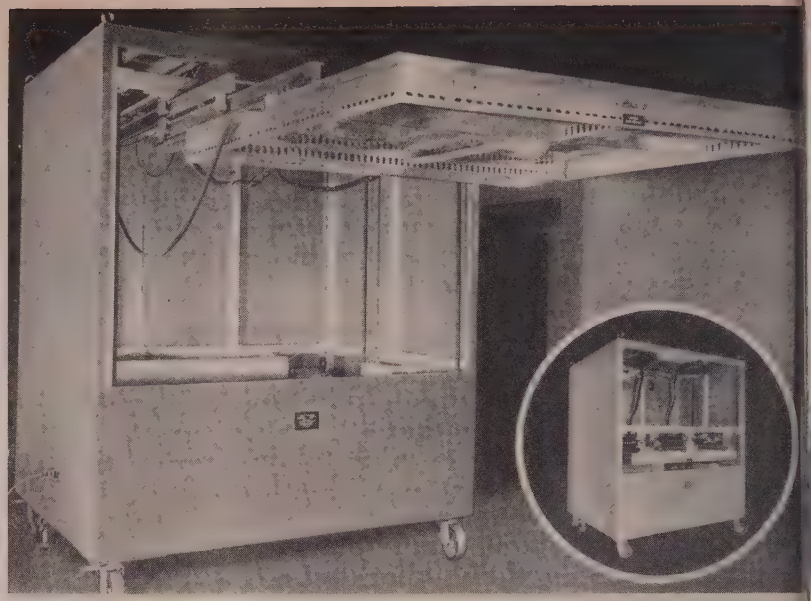

Mobile Radiant Heater Aids Forming of Exotic Metals

Electric Hotpack Co., Inc., Philadelphia, is producing a new portable radiant heater that heats titanium, magnesium, Inconel, molybdenum, and their alloys, to forming temperatures right at the drop hammer or press.

The heater is said to eliminate rejects resulting when metal ductility is weakened through heat loss during transfer of blanks from a remote oven to the forming facility.

A gold plated, retractible lamp head, holding up to 99 infra-red quartz bulbs, delivers temperatures to 1500°F at the forming block. This does away with the need to heat soak, and possibly contaminate, blanks to compensate for losses in temperature during transfer from the oven.

The fan-cooled lamp head can be maneuvered in all directions by remote cable controls. According to the firm the bulbs provide instantaneous high temperatures, require no warm-up, and operate on a two bank system. Blanks can be heated and formed in seconds with elongation as much as 11%, says the company.

Aluminum Production Process 75 Years Old; Hall Honored

It was only 75 years ago this month that Charles Martin Hall successfully produced aluminum by passing an electrical current through a molten mass containing alumina and cryolite.

To honor this anniversary, the Aluminum Association sponsored a celebration at Oberlin (Ohio) College on February 16. This is where Hall received his formal education and is just a few miles from the scene of his discovery.

An imposing group was to be present to speak on aluminum's future: James C. Hagerty, former White House press secretary; Philip Sporn, president of American Electric Power Co.; Philip Will Jr., president of American Institute of Architects; and Dr. W. A. Pennington, president of American Society of Metals and University of Maryland metallurgy professor. Dr. Robert Carr, Oberlin's president, and M. M. Anderson, president of the Association, presided over the ceremonies.

During the program an aluminum plaque was presented to Oberlin as a token of a permanent aluminum museum display which the Association will donate to the college when its new Hall of Science is completed.

Charles Martin Hall was only 22 when he met success. Another 22-year-old—Frenchman Paul Heroult—made the identical discovery in the same month and year as Hall. Each youth worked unknown to the other, contriving his own experiments on homemade equipment. Hall worked in his father's woodshed, Heroult in his father's tannery near Paris.

The two inventors learned about each other when they filed patent applications. From then on the two men lived to enjoy the rewards of their genius—until 1914 when they both died at age 51.

But the February 16 celebration was in honor of Hall. He had graduated in mid-1885, and by the close of the year was forming a new idea on an inexpensive method of producing aluminum—a problem which had baffled scientific minds for many years.

In February, 1886, Hall made a solu-

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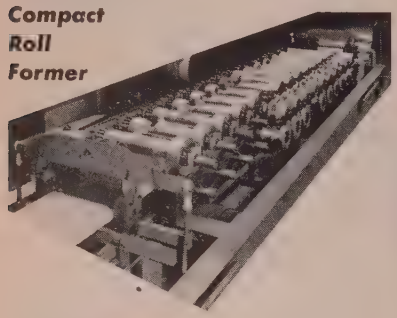

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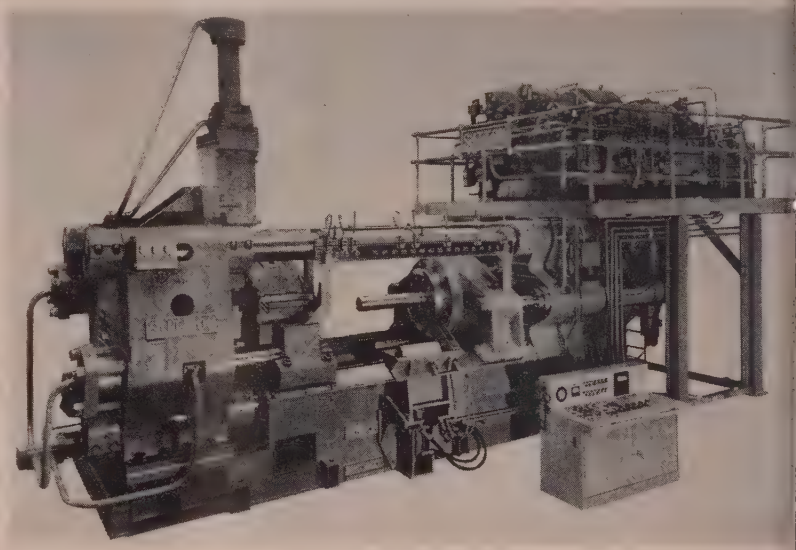
tion of alumina in a waterless vehicle, added a solvent more chemically stable than alumina, and formed a bath to conduct electricity. Cryolite was used as the solvent because it melted easily and when molten dissolved alumina in large proportions.

Next, an electric battery was set up, some cryolite was melted in a carbon crucible, alumina was dissolved in it, and an electric current was passed through the molten mass. After two hours, the mass was poured off, and at the bottom of the crucible were a number of globules of aluminum.

This process proved commercially applicable and inexpensive. Except fo some minor changes, it was the sam method used by the U.S. primary pr ducers last year to make 2,014,299 to of aluminum.

It was a humble start. But last ye the building industry used more tha 500,000 tons of the metal; the 1961 fle of new autos average about 63 poun of aluminum per car; and some 23 000 tons of aluminum were used in ele trical power transmission and distrib tion. Many more tons found their w into appliances and packaging appli tions, with new uses for the light met being developed each day.



Architectural Sections Extruded by 2200-Ton Press

A 2200-ton hydraulic extrusion press designed for fully automatic, high speed production of aluminum architectural sections and components has been added to the line of Sutton Engineering Co., Pittsburgh, Pa.

The press has a DV control system with a remote panel located on the front of the press. This permits sta ing or stopping the cycle and regul ing extrusion speed from the runo table as well as from the control pulp

First of the new units to be built in use at the Richmond, Calif., pla of Kawneer Co. Billets from 7 to inches diameter can be extruded.

Aluminum-Glass Buildings To House U.N. Workers

A $40-million development of apartments and offices adjoining United Nations headquarters, will be constructed before the end of 1963 through the joint efforts of Aluminum Co. of America and Webb & Knapp Inc.

The two concerns recently disclosed they have agreed jointly to develop a square block on Manhattan Island, immediately north of the U.N. General Assembly and Secretariat Buildings, with a group of aluminum and glass luxury cooperative apartments and an office building.

The exact number of structures and definite architectural details have yet to be determined. Construction is scheduled to start this year, and will be co pleted within 18 months.

The new buildings will be planne to complement the U.N. enclave arc tecturally. While the buildings will ha no official status with the U.N., a tenants other than those affiliated wi that body will occupy some offices a apartments, they will be designed give the needs of United Nations' t ants priority.

The development is being planned the New York architectural firm of H rison & Abramovitz, a leading memb of the group that designed the 39-sto green-glass and aluminum Secretar tower and its companion structures.

; with the design will be I. M. Pei
ociates.
e still preliminary concept of
d Nations City envisions a group
minum and tinted glass structures,
bly in the height range of 20 to
ories, with landscaping between
arking facilities under a plaza on
the buildings will sit.
e apartment units, all air-condi-
l, are expected to provide an airy
asis on surrounding views through
mployment of wide expanses of
framed in aluminum. This rela-
new concept now is becoming the
nark of modern multi-unit dwell-
ouses—an area of home building
is progressing strongly against the
in residential construction gener-
revalent since mid-1959.
oa has a 40% interest in the proj-
The arrangement is similar to the
nnounced last August calling for
o firms to build Century City in
ngeles. It will be a community for
persons constructed on an old
lot (see MM, Sept. '60, p. 88).

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to fit all popular oscilloscope
s is now available from the In-
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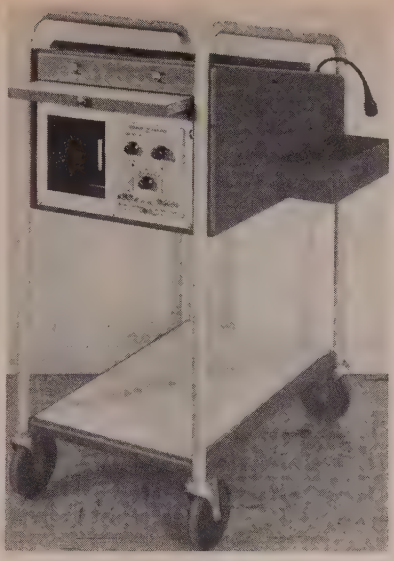

Aircraft Co., Los Angeles.

The cart is equipped with large full-swivel casters and a bottom tray for storage of auxiliary equipment and accessories. It also has a pull-out leaf for writing, and a drawer for manuals, instruction books, tools, parts, etc. The cart contains a 6-foot retractable power cord with duplex outlet, mounting provisions for two spare amplifiers, and snap clips for storing probes.

3300-Ton Extrusion Press To Be Installed in India

India will receive a giant 3300-ton hydraulic self-contained aluminum extrusion press which operates at 2750 psi. The machine was designed and manufactured at the Rochester, N. Y., plant of Watson-Stillman Press Division, Farrell-Birmingham Co., Inc.

Included with the press are two detwisting stretchers in capacities of 100 and 25 tons and a 100 ton straightening press.

The press length, without runout table, is 42 feet 7 inches. Overall height above floor line is 17 feet and the depth below the floor line is 3 feet 4¼ inches. The press has a maximum width of 20 feet 7 inches and weighs approximately 225 tons.

Extrusion speed at 3300 tons is 43 ipm and 52 ipm at 2750 tons. Maximum round billet dimensions are 14 inches diameter and 30 inches long. Approximate dry cycle time is 23.30 seconds. This press is equipped with a double die slide, and has an automatic bridge die cycle.

The firm is also constructing a 5000-ton extrusion press which is reportedly the largest self-contained press of its type in the world.

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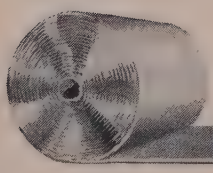

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The operator's weight on the no skid steps depresses springs in the la der and automatically locks the tru to the floor. The ladder trucks are ava able with two or three shelves and range of ladder heights.

Width is 22 inches with lengths at 4 46 and 52 inches. Trucks weigh abo 70 pounds; have a load capacity of 5 pounds.

Alcoa Die Casting Plant Aims at Car, Other Marke

A modern aluminum die casting pla —Alcoa's new Edison Works—is now operation near Metuchen, N. J.

Works Manager Charles G. Wist said initial limited operations involv production on several die casting m chines. The new plant will also pr duce permanent mold castings when a ditional facilities are installed th spring.

With the completion of Edison work 260,000-square-foot building, and the i stallation of its facilities, the operatio gradually will supplant Alcoa's small Garwood (N.J.) die casting works, miles northeast, and the company Bridgeport (Conn.) permanent mo foundry. Both of the older plants w cease production later this year.

The Edison works' combination die casting and permanent mold produ tion will make it a supplier to the aut motive, aircraft, building, electrical, o fice equipment, and appliance indu tries. The plant will employ 700 perso when operating at capacity.

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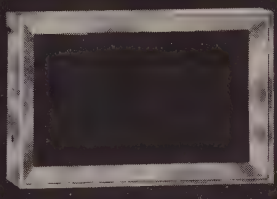
Clock Frame is a single extrusion which undergoes 12 separate operations — regular services at G.E.I.

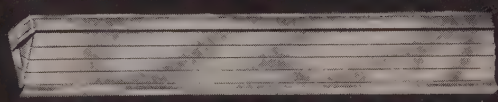


B

Nameplate letters are pressed with embossing dies, brite-dipped and spray-painted by G.E.I. specialists.

C

Frame is V-notched to wrap around three corners.



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Modular Containers Speed Express Service

Faster, more efficient package small shipment handling is an imp tant goal for any carrier, and the R way Express Agency, or REA Expr has made a giant step in this direct with its regularly scheduled express tainer-on-piggyback car service betw New York and St. Louis and four ot cities en route.

The system affords easy, one-man lo ing and unloading of two-ton capa 4 x 8 x 8 foot magnesium (ZE-10 al containers to and from four contai racks cradled on an 85-foot Gen American Transportation piggyback Carrying 20 containers or mixed c binations of containers on racks, 20 40 foot containers, or truck trailers, car has a 70-ton capacity. The cont ers are products of Fruehauf Tra Co., Detroit.

The development for the first t makes possible the handling of la volumes of express shipments to from passenger trains at way po where only brief stops can be schedu

Other speedups and benefits in containerized line haul movement package and small shipment traffic clude reduced handling of indivi shipments at terminals and in exp cars; pre-assorting of shipments i containers according to destination; tection of shipments; and a reduc in split-lot deliveries.

A companion system featuring he er, somewhat larger steel containers also been put into the New York Louis run, REA said.

rn Firm Expanding , Coil Capacity

k to expand its aluminum sheet l production capacity to 150 mil- unds a year has been started by State Metals Co., Lancaster, Pa., of Howe Sound Co. The firm is ing its manufacturing area by square feet, and adding new ent.

following machinery has been l: Four-high, single stand Bliss ishing mill; Bliss stretcher-level- esch slitting line; Stamco slitter; ll-Dressler combination homogen- nd preheat furnace; a Swindell- r controlled atmosphere furnace; Dalstrom sheeting line which will pled with a Maust roller leveler.

ct Extrusions Enhance utive Chair Line

minum impact extrusions are do- unobtrusive job of enhancing pearance of executive chairs made he Taylor Chair Co., Bedford,

or uses the impacts for ferrules , cylinder-shaped parts that slip he rounded vertical caster sup- f the company's executive chairs. atin-finished aluminum ferrules e contrast to the wood of the base, and increase the strength pivot swivel receptacle.

chair uses ferrules, finished in natural aluminum or brass They are anodized after prelim- reatment to provide a slight matte Economies afforded by impact ex- allowed Taylor to accent its designs without increasing price.

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•

Augmenting its manufacture of super purity aluminum (99.99+% pure), Consolidated Aluminum Corporation announces the acquisition of A.I.A.G. Metals, Inc. Consolidated through its subsidiary now becomes the exclusive United States distributor for highest purity gallium and super high purity aluminum (99.999% and 99.9999%), both produced by unique processes of Aluminium Industrie A.G. of Switzerland under the most rigid controls. For further information on new developments in gallium and its compounds please write:

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Liquid Aids Opening Of Aluminum Windows

Metal windows that become stuck can now be easily opened with Clinch Metal Window Ease says Dynamic Chemical Co., Inc., Danbury, Conn.

According to the manufacturer, the liquid has a disintegrator action that penetrates iron and aluminum oxides and dirt which prevent easy opening of metal windows.

The odorless, non-flammable material works equally well in hot or cold weather, says the firm, and leaves no residue to form gum or become tacky.

Alcan Continues Tank-Hopper Car Tests

Aluminium Limited announced that it has completed impact tests on its radically new tank-hopper car at Alcan's Kingston, Ontario plant.

The impact tests constitute the second phase of an exhaustive testing program. During the first phase, the Alcan car was deliberately overloaded for static test. Phase three will be high speed, long distance road tests; in the fourth phase (the last) the car will be subjected to fatigue tests on a pulsating jack. The car is said to offer many cost and design advantages.

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K100R	High Luster Zinc Brightener—Rack
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NON-FUMING DIP FOR ALUMINUM CASTINGS ADOPTED BY LEADING ELECTRICAL PARTS MFG.

Magnesium Stays Flat, Rou For Recorder Turntables

Turntables for phone answering a message recording devices made Electronic Secretary Industries, W kesha, Wis., have to meet and re two rigid specifications—perfect flat and roundness.

In designing a turntable for Model SP unit, two different types recordings had to be provided First, this announcement by the t phone subscriber: "I am out of office. This machine will record y message." Then, the callers' messa

The final design provided for single-channel magnetic tape on edge of the turntable, for the nouncement, and a 10-inch magn recording disc for the callers' messa Thus, the turntable had to be b perfectly flat and perfectly round within close tolerances—and had to that way.

Spun-aluminum turntables were fectly round, but could not be made flat as necessary—probably because stresses set up in the spinning op tion. The firm then turned to Mathi Magnesium, also of Waukesha, v developed a turntable made of 0. inch magnesium alloy AZ31-C.

Each turntable is formed of a d 9-15/16 inch diameter, and a 1 inch s which is formed into a ring and s welded to the disc at six points. A turned from a 2-inch rod of the s material is riveted to the center of disc, and a steel shaft is inserted staked in place.

The shaft serves as a center turning the assembly to an outs diameter of 10 inches and an I.D. 9⅞ inches. To clear equipment mo ed underneath the turntable, the w must be cut to a radius of 1/16 i this cut serves also as a test of w penetration.

The complete assembly must pa final test, providing for a "runc tolerance of 0.01 inch and a "flatn tolerance of 0.02 inch. Electronic Se tary finds these tolerances are within the limits required for its eq ment.

r Purity Plant ull Production

t is claimed to be the largest purity aluminum plant in North a is now in full production, says dated Aluminum Corp., Jackinn. The firm completed construc- its expanded plant last June, ing production more than 200%, apacity now at 300,000 pounds h.

lco super purity aluminum is as Raffinal, and as Reflectal alloyed for structural strength. purity aluminum is finding ing uses in the petroleum, chemid electronics industries, and is sed for automotive exterior trim, im, reflectors, etc.

according to a recent announcey the Business and Defense Servdministration, the demand for purity aluminum is expected to han double by 1965 to over 15 pounds per year.

Car Speeds ng Operations

our or more of production time gained every day on slitting line on by speeding up coil loading nloading. This can be done by ts side lift coil car claims Braner ering Inc., 1316 W. Lake St., o 7.

ing the uncoiler or unloading oiler is a one man operation ached in less than one minute, says Slitter operation can be virtualinuous. The next coil to be slit vs in stand-by position on the coil til needed. At the touch of a it is raised to drum height and into position, ready for threadthe recoiler end, the procedure ly reversed.

er coil cars operate on standard ction steel track and require only 25 square feet of clear floor area t to the uncoiler or recoiler. cars have a 62-inch diameter coil y, are push button controlled, nti-friction bearings and uncoil 0 to 60 linear feet per minute.

Cutting Fluid, Coolant Doesn't Stain Aluminum

A new cutting fluid and coolant has been especially formulated for the severest machining and grinding operations without staining aluminum or brass, claims The Master Chemical Corp., 13 N. Huron St., Toledo, Ohio. The product has been field tested for 14 months and is now being marketed.

Called Trim H. D., the fluid was developed in an effort to eliminate many difficulties peculiar to heavy broaching, reaming, threading and tapping.

"In some cases tap life has been increased two to four times over that obtainable with straight cutting oil on high speed tapping operations," says the firm. "The very low viscosity of Trim H. D. allows fine chips to settle rapidly, whereas heavy oils hold the chips, wedging them between the relief tap and the work, and causing wear and often breakage of the tap."

Trim H. D. is a white jell which is diluted with water for use. The firm says there is no odor, rancidity, gumming, or skin irritation, and that the work can be seen through the translucent fluid.

AMERICAN ROLLER DIE CORP. ARDCOR

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produces MILLIONS of SQUARES

of

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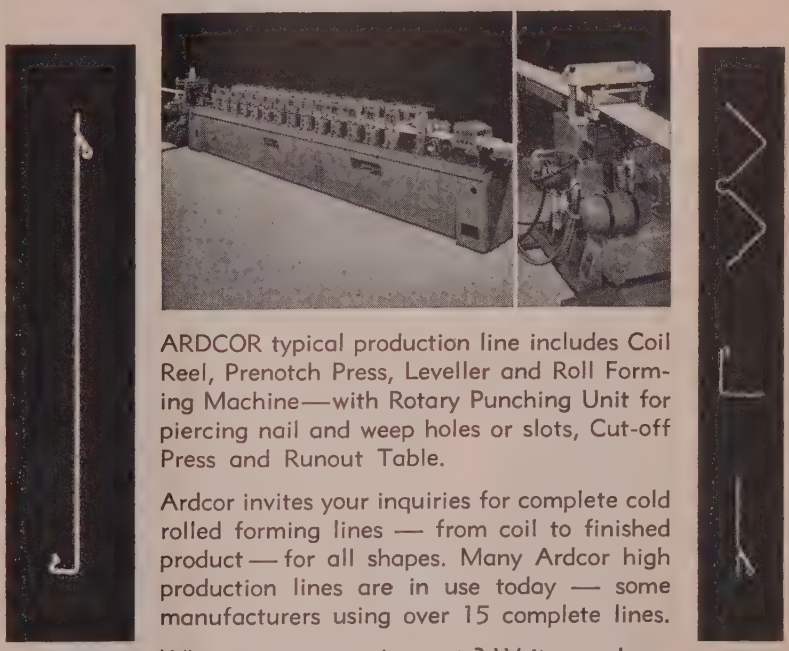

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New Aluminum Can Facto Will Be Built in Portugal

As part of its market developm Aluminium Limited says it is coope ing with Portugese canning interest build and operate a plant in Portu to produce aluminum fish cans.

Use of such cans, particularly sardine packs, has been pioneered Limited's affiliates in Norway for m years, Limited said. Practically all N wegian exports of kippered herring most sardines are now packed in minum.

"Introduction of aluminum te niques to Portugal, where sardine duction is a major industry, will based on the Norwegian experien the company said. "Aluminum cans vide considerable savings in shipp expenses as compared to heavier ca

The Portugese sardines will be m keted mainly in the United States wh aluminum fish cans are increasingly p ular because of their ease of openi attractive appearance and resistance corrosion.

Initially the new can plant will specially anodized and lacquer-sea aluminum strip produced by Limite affiliates in Norway and England. ternal lacquering of cans at one ti presented problems which have n been overcome. The lacquer used aluminum cans has been approved the U. S. Food & Drug Administrati

The new can making company, which two of the principal Portug fish canners are participants, is cal Fabrica de Emballagens de Alumi Limitada. Its plant will be in prod tion later this year at Matosinhos, main center of the fish canning ind try. Capacity of the plant is expec to reach 12 million cans per year, d ing the introductory phase.

Tubular Crossarms Brighten Transmission Line

The skyline between St. Helens a Burlington, Oregon, is punctuated by series of glistening new landmarks large aluminum tubes serving as cro arms for H-frame structures of a n 115,000 volt Portland General Elect Co. power transmission line to serve t St. Helens area.

The aluminum arms, supplied by coa, are mounted on all 98 H-type stru tures, comprise about 11.5 miles of t line's total length. Vertical supports a wood poles.

Four different varieties of tower co prise the aluminum-arm group. T majority employ a 26-foot arm, 8-in diameter, .188-inch wall, extruded fro 6061-T6 alloy. For the balance of t towers, tubes range from 16 to 28 fe long, used singly or in combination two tubes per structure.

nt Claimed Safe lon-Ferrous Metals

w grinding coolant that is re- to be safe to use on nonferrous nas been developed by the Serv- lucts Division of Johnson's Wax, Wis.

l Mill Stream, the new product used interchangeably for grind- ous and nonferrous metals with- naging valves or other fittings in ant system. Magnesium and duc- are the only metals with which coolant cannot be used.

ional advantages claimed for eam are its ability to stay clean p wheels open so they continue to grade and grit size, and its ce to rancidity. The product is ning even in high-pressure, high- coolant systems.

Engineers Develop luminum Water Tank

ll-aluminum water tank, semi- nounted, possessing several high- able features not found in the ter tank trailer which it replaces, n developed by the U.S. Army r Research and Development tories, Fort Belvoir, Va.

new tank trailer is unique in is not mounted on a frame, h it has on overall length of 248 inches and weighs 6425 The use of aluminum also gives ater payload to weight ratio over l tank, aluminum having a 2000 capacity compared to 1500 for n addition, the aluminum tank ot require a protective interior r coating as does the steel tank. aluminum tank is insulated and heating system, making it more for desert or arctic operations. quipped with a military design pump, and has room for carrying ch suction hose sections, and 150 2-inch canvas hose.

tank was built principally of 4 aluminum, with 6061 T6 or ninum used in areas where extra n is needed. It is mounted on a d Ordnance axle assembly, and is y towed by a 2½-ton tractor. nk was built by Standard Steel North Kansas City, Mo., under with the Laboratories.

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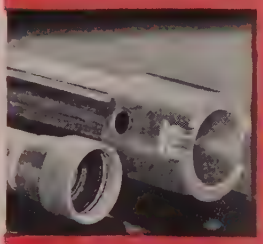

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Production Requirements Met by Refractories

Refractory products made by the H. K. Porter Co., Inc., Porter Building, Pittsburgh, are said to be manufactured for all phases of aluminum production, from calcining bauxite to casting the finished product.

The firm reports it has refractories specially developed for rotary kilns, melting pots, carbon baking furnaces, foundry ladles, pouring and molding equipment, and remelt, holding, alloying and reclaiming furnaces.

Wide Extrusions Sheath Substation

Aluminum sign extrusions have b used in St. Louis by Union Electric to build an attractive yet low-cost station enclosure.

The 20-foot x 9-inch extruded sections, fabricated by Reynolds Me Co., were erected at the company's n set substation in suburban Sunset H Mo.

The company found this type of closure less expensive than metal pi fence, prefabricated redwood lo panels, and masonry walls.

The sign sections provide a neat, cl looking enclosure that hides much the substation equipment. This type closure was desirable at the Sunset S tion because it is located in a resi tial area.

Bridgeport Brass, National Distillers Discuss Merger

Bridgeport Brass Co., Bridgep Conn., and National Distillers & Ch ical Corp., New York, have had a association which will become even er if current discussions lead t merger. Both companies agree tha date the talks have been only expl tory.

National Distillers became a prod of titanium sponge in late 1957 w its division, U.S. Industrial Chem Co., started up at Ashtabula, Ohio. division's outlet was Mallory-Sharon tanium Corp., Niles, Ohio, which me the sponge to produce titanium in Since that time, National Distillers terest in the exotic metals has grow include production of zirconium, h um, columbium, tantalum, and oth

Meanwhile, Bridgeport Brass, on the nation's oldest metalworking panies, has over the years develop facility with these metals. Its forte, ever, has been brass mill products, aluminum sheet, strip, forgings, e sions and tube.

After a stint as operator of Mal Sharon Metals Corp. (partly owne National Distillers), Bridgeport B

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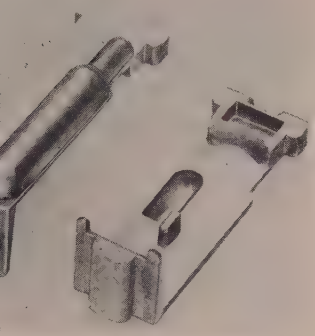
Write for Complete Details

d charge of Reactive Metals Inc., formed last May by National rs and Sharon Steel Corp. to pro- rconium and titanium mill prod- d some of the more exotic metals icated form. At that time it was ced that Bridgeport Brass had the to buy into Reactive Metals after rs. The company had the same in its association with Mallory- Metals Corp.

year National Distillers netted 000 on sales of $580,172,000 in sions (including alcoholic bever- n the first three quarters of 1960, ort Brass earned $2,148,360 on taling $110,915,237.



Rifle Has Die Cast inum Follower

cam follower of the AR-15 com- e, billed as the "world's most shoulder weapon by its manu- . Colt's Patent Fire Arms Mfg. an aluminum die casting. It was or Colt by The Newton-New Co., custom die casters of West Conn.

fications of the AR-15, also called malite, called for extreme light high accuracy and high-speed tic firing. The cam follower (two hown) is an important compo- or this last-mentioned specifica- pushes 20 rounds of ammunition one from the magazine into the r; must give jam-free service.

specifications of the new rifle full and semi-automatic fire (maximum fire power is 720 per minute at full automatic), launching capabilities and com- . When fully loaded the Arma- ghs only 5 pounds 11 ounces. inum is said to be widely used out the rifle's construction and of this the user would go into armed with 60% more ammuni- mpared with any other weapon nade today.

has hard-coated all the metal the Armalite. One hundred f salt spray testing showed no n. Colt reports that the alumi- m follower was fully adaptable hard coat process.

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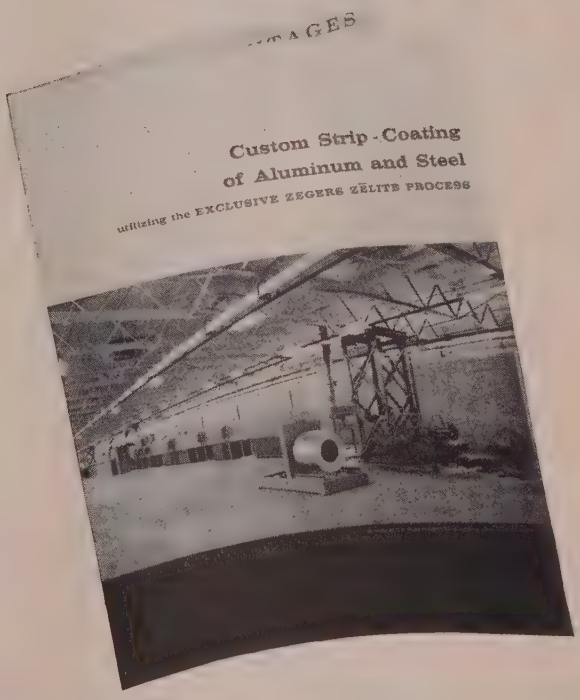

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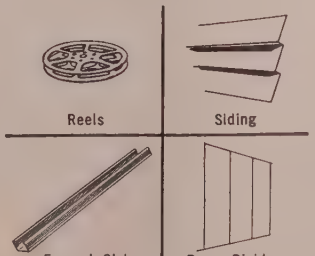

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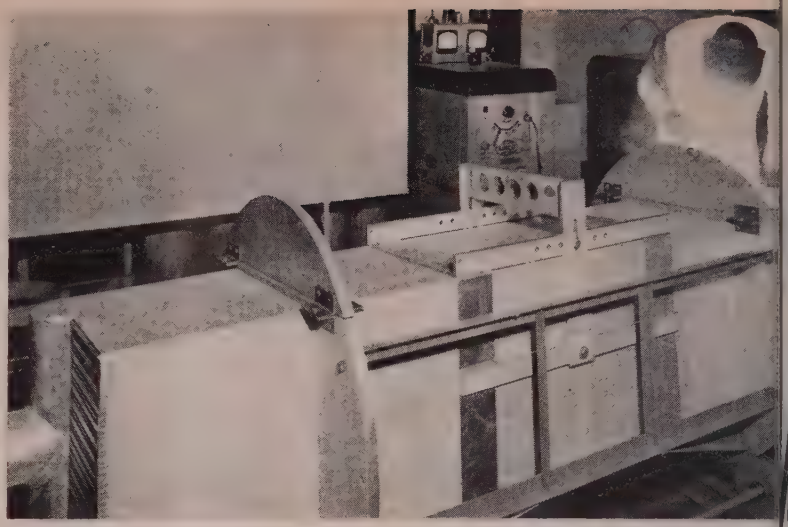


Giant Unit Dip Brazes Aluminum Cryogenic Equipment

A giant facility for the manufacture of brazed aluminum plate-and-fin heat exchangers for extremely low temperature applications in oxygen and air separation, gas fractionation and other types of chemical and petro-chemical plants has been installed in Stewart-Warner Corp.'s South Wind Div'n, Indianapolis.

First production in the new facility, marking Stewart-Warner's entry into the industrial cryogenics field, was of a quantity of exchangers of approximately 8000 square feet exchange surface, reportedly the largest of this type ever fabricated. They have been delivered to a builder of plants for production of oxygen and other gases.

Aluminum heat exchangers with 22,000 square feet of heat transfer surface, approximately three times the size of units which were previously available, may be dip-brazed in this new facility.

Lindberg Engineering Co., 2450 W. Hubbard St., Chicago, designed and built the facility. Exchangers are automatically dip-brazed in a Lindberg-Upton salt-bath furnace, after which they are processed through elabor cooling, flushing, cleaning and weld (above) operations.

The significance of the availability large-size aluminum plate-and-fin h exchangers lies in the substantially l er unit and installation costs, as wel in reduced operating expenses. Th economies are particularly signific when compared with the conventio shell-and-tube heat exchange equipme

In applications where 3000 square or more of heat exchange surface is quired, the original cost of alumin plate-and-fin units, per square foot surface, is approximately one-third t of comparable mild steel shell-and-tu exchangers, says Stewart-Warner. T cost of aluminum plate-and-fin excha ers is even more favorable when c pared to stainless steel, brass or alu num shell-and-tube exchangers.

In low temperature plants, the cl control of approach temperatures wh can be achieved with the alumin plate-and-fin type of heat exchanger duces refrigeration costs and perm more efficient plant operation.

Precision Beryllium Works Is Nearing Completion

A $3 million expansion of beryllium facilities is being completed by Wyman-Gordon Co. at its North Grafton, Mass., plant, to which precision forging equipment has been transferred from the firm's Franklin Park, Ill., plant.

The expansion and equipment transfer, according to the firm, "rounds out our facilities for improved production of beryllium from powder form through forging to machined parts."

Beryllium processing space will be increased from 4000 to 16,000 square feet. Included will be vertical boring machines, lathes with tracer controls, test-turning lathes and auxiliary equipment. Lockers and showers for more than 100 men will be provided. The tire installation will be air conditio throughout and dust collecting mach ery will provide atmospheric control manded in close tolerance work.

Transferred equipment includes 6000 ton and a 3000 ton press, requi for precision work on small parts p duced from beryllium and other met

Beryllium has outstanding physi mechanical and thermal properties a nuclear characteristics. Potential us includes structural components for craft, missiles and space vehicles, entry shields, guidance components, craft brakes, compressor disks, ro shafts and nuclear reactor compone

Applies Flux urnace Interiors

mpact, portable pressure device d especially to apply fluxes to the s of reverberatory melting units g marketed by Foundry Services, leveland 35.

vn as the Reverbagun, the equip- applies Foseco furnace-cleaning flux to the walls of large aluminum furnaces, facilitating removal of oxide build-up and increasing melting efficiency, claims the company. Covering and drossing-off fluxes can also be applied with gun.

The unit consists of a cylindrical flux tank, pressurized by connection to any low-pressure air line; a discharge hose; and a lance fitted with a spreader. In operation, the lance is inserted through the furnace door, the air-control valve opened, and the flux distributed to any part of the furnace by aiming the lance assembly.

The unit comes with pressure gauge, flow and pressure-relief valves, hose, lance (with two extensions) and spreader.

Men-on-the-move

Edward P. Sandbach was recently named manager of manufacturing operations of the Mackintosh-Hemphill Div'n of E. W. Bliss Co., Canton, Ohio. His former position as chief metallurgist has been filled by **Steve Stasko.**

Cyrus D. Dunthorn, general sales manager at Jarl Extrusions Inc., has been elected vice president in charge of sales of the East Rochester, N. Y. company.

John F. Price has been named sales manager of Consolidated Aluminum Corp., Jackson, Tenn. He will work primarily in the field of plain foil and allied products; will headquarter in New York.

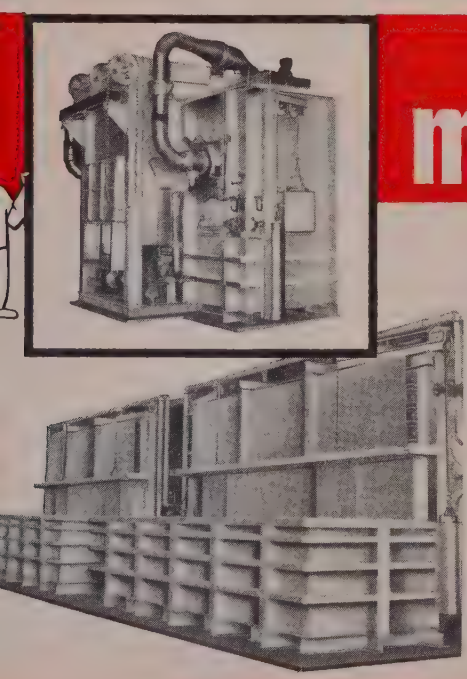
Thomas J. Ready, Jr., executive vice president of Kaiser Aluminum & Chemical Corp., Oakland, Calif., has been elected a member of the corporation's board of directors.

Leo Reierstad has been appointed general sales manager of Permanent Mold Die Co., Inc., Hazel Park, Mich., and subsidiary companies: Piston Mold Die Co., and PMD Extrusion Die Co.

Sidney Throne is now vice president of Atlantic Aluminum & Metal Distributors, Springfield, Mass. He will head up the firm's sales department.

Sanford M. Treat is now New York district sales manager for Aluminium Limited Sales Inc. He is in charge of aluminum sales in 21 eastern states. Also, **W. G. L. Murphy** has been named Los Angeles district sales manager by the firm.

Appointments of **Eugene L. Mackey** as vice president in charge of engineering, **Elmer A. Koenig** as vice president in charge of sales, and **Theodore R. Stroomer** as sales manager, have been announced by The Yoder Co., Cleveland.



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No matter how much metal you desire to cast daily, with a WARWICK Reverb you will always be assured of having it on hand, in perfect condition, ready for tapping or pouring. Now in operation in many prominent plants they have proved their efficiency and economy in operation . . . have effected savings that have soon paid for their installation.

WARWICK Metallurgists with their vast knowledge and know-how in melting room procedure, layout and production will be only too glad to consult with you on all or any of your metal melting requirements. They will be glad to offer suggestions for speeding production and cutting costs. A letter, phone call or wire will bring one at your convenience. Let us hear from you.

WARWICK CONTROL PANELS

WARWICK design monitor for furnace metal temperature, refractory temperature, high limit temperature override, blower motor interlock, electric ignition and flame safety control with complete automatic built in warning system. Panel boards are prewired and laboratory tested prior to shipment.

Warwick INDUSTRIAL
FURNACE & ENGINEERING CORP.
SINCE 1895
2 West Chicago Avenue Chicago 10, Ill.

Remember . . . WARWICK builds all types of furnaces for the melting of non-ferrous metals. Let them show you how one will fit into your plant. Write today.

Rigid Conduit Shipped With End Protectors

Fully-capped threads are now standard for the complete line of rigid conduit, ranging in sizes from ½ inch to 6 inches, offered by Harvey Aluminum, 19200 S. Western Ave., Torrance, Calif.

Conduit lengths are now furnished with closed-end plastic caps, protecting the interior as well as the threads from damage, dust, and dirt in storage and handling. Said to be more firmly seated than conventional protective rings, the color coded caps can be detached and re-used on the job as a plug shield against paint, plaster and work rubbish.

10 Pounds of Magnesium Per Automobile Seen by '65

Volume usage of magnesium on large automotive transmission parts within the next three years was predicted recently by an executive of The Dow Chemical Co., Midland, Mich.

Robert Pittsley, magnesium sales manager of Dow's Detroit office, also forecast that the automotive industry's use of magnesium will exceed 10 pounds per car by 1965. He made his comments at a luncheon held in connection with the International Congress and Exposition of Automotive Engineering.

Heat Treating Furnace Has 300° to 2400°F Range

A 300°F to 2400°F temperature range is the principal feature of a new furnace brought out by Sunbeam Equipment Corp., 180 Mercer St., Meadville, Pa.

The furnace can be used for annealing, pack carburizing, hardening, normalizing, preheating, stress relieving and tempering. Both ferrous and nonfer alloys may be heat treated under curate temperature control. Bur have a 95% turn down ratio for d temperature control and heat distri tion.

Units are gas fired heating in t standard sizes with work areas ran from 4 inches high by 8 inches wid 12 inches deep to 9 inches high b inches wide by 24 inches deep.

Venezuela to Have Reduction Plant

An aluminum reduction plant is t built in the Caroni region of so eastern Venezuela in accordance an agreement between the Venezu government and Reynolds Internatio

Ultimate cost of the plant is expe to be more than $30 million. Initial nual production capacity will be at 25,000 tons. About 80% of this pro tion is expected to be consumed Venezuela. The remainder will be ported.

An agreement has been signed viding for 50% ownership by Reyn International and 50% by a comp owned by government interests. contract provides for a 30-year po supply from the Caroni River hy electric project.

Precisioneered for Highest Annealing Qualit

4 NEW ROCKWELL OVENS for Aluminum Strip

These high velocity, recirculating type ovens, recently installed at Bridgeport Brass' Warren, Ohio, plant, are used for atmosphere annealing coiled aluminum strip of many widths and gages. They constitute a new addition to the long list of outstanding Rockwell installations in the aluminum industry.

They are used to heat, soak and cool aluminum coils in an exothermic atmosphere with closely controlled temperature uniformity, despite a work load of up to 30,000 lbs. per batch.

Included in this Rockwell-engineered project are the cooling systems for the ovens, exothermic gas generators, temperature and safety controls, work trays, etc.

W. S. ROCKWELL COMPANY
2060 Eliot Street • Fairfield, Conn.

Proof positive of Rockwell's all-around ability to do the complete job—large or small. Bulletin 128 gives more evidence—yours on request.

...ere to buy... MATERIALS EQUIPMENT SERVICES for the Light Metals Industry

S BUYERS GUIDE IS PUBLISHED FOR PRODUCT MANUFACTURERS AND RICATORS WHO ARE SEEKING SUPPLIERS OF MATERIALS, EQUIPMENT D SERVICES. THE FIRMS LISTED ARE CURRENT ADVERTISERS IN MODERN METALS. THEY CONSTITUTE ALL MAJOR SUPPLY SOURCES.

MATERIALS

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m Limited Sales, Inc.
th Avenue
ork 20, New York

n Co. of America
coa Building
rgh 19, Pa. (Al)

Aluminum Co.
ox 1654
lle 1, Ky.

rt Brass Company
nd St.
port 2, Connecticut

Metal Products Co.
Dow Chemical Co.
d, Michigan (Al&Mg)

Extrusions, Inc.
ake Park Road
town, Ohio (Al)

uminum
e, Calif. (Al)

nal Selling Corp.
42nd St.
ork 17, N. Y.

uminum & Chemical Sales
Center
1 12, Calif.

Wire & Aluminum Co
ort, Iowa (Al)

inum
k Avenue
rk 22, N. Y.

Aluminum Alloys Co.
ille, Pa.

Extrusions, Inc.
Green St.
ille, Ill.

pper & Brass, Inc.
k Ave.
rk 17, N. Y.

Metals Company
Broad St.
nd 18, Va.

anufacturing Co.
Street
ury, Connecticut

Extrusions Company
Washington Street
ia. Arkansas (Al)

ndustries, Inc.
kwood Ave.
own, Ohio

minum Corp.
Liberty, Ind.

Tube Div.
& Hecla, Inc.
outhfield Rd.
ark, Mich.

ALUMINUM

n Limited Sales, Inc
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rk 20, New York

Billets, Inc.
kwood Ave.
own, Ohio

& Magnesium, Inc.
y, Ohio

Co. of America
oa Building
gh 19, Pa.

Aluminum Co.
ox 1654
le 1, Ky.

Apex Smelting Company
2537 West Taylor Street
Chicago 12, Illinois

International Selling Corp.
220 E. 42nd St.
New York 17, N. Y.

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Wolverine Tube Div.
Calumet & Hecla, Inc.
17262 Southfield Rd.
Allen Park, Mich.

BILLET, MAGNESIUM

The Dow Metal Products Co.
Div'n, The Dow Chemical Co.
Midland, Mich.

BRAZING SALTS, ALUMINUM

Heatbath Corp.
Springfield 1, Mass.

Park Chemical Co.
8074 Military Ave.
Detroit 4, Mich.

CALCIUM METAL

Dominion Magnesium Limited
320 Bay St.
Toronto, Ont.

CASTINGS, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

Federal Die Casting Company
2226 North Elston
Chicago, Illinois

Southern Die Casting & Engineering
206 Albertson Rd.
High Point, N. C.

CASTINGS, MAGNESIUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

CIRCLES, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Fairmont Aluminum Co.
Fairmont, W. Va.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

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Allied Research Products, Inc.
4004 East Monument St.
Baltimore 5, Md.

Alumi-gard Co.
1638 W. 79th St.
Chicago 20, Ill.

Amchem Products, Inc.
Ambler 12, Pa.

Conversion Chemical Corp.
99 E. Main St.
Rockville, Conn.

Diversey Corp.
1820 Roscoe St.
Chicago 13, Ill.

Frederick Gumm Chemical Co.
538 Forest St.
Kearny, New Jersey

Heatbath Corp.
Springfield 1, Mass.

The Hodson Corp.
5301-11 W. 66th St.
Chicago 38, Ill.

Kerns United Corp.
2659 E. 95th St.
Chicago 17, Ill.

Magnus Chemical Co.
60 South Ave.
Garwood, N. J.

Neilson Chemical Co.
2318 Gainsboro
Detroit 20, Mich.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Oakite Products, Inc.
50A Rector Street
New York 6, N. Y.

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

COATINGS, ELECTRICALLY CONDUCTIVE

Amchem Products, Inc.
Ambler 12, Pa.

Grafo Colloids Corp.
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

COIL, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

Consolidated Aluminum Corp.
Jackson, Tenn.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Chase Brass & Copper Co.
Waterbury 20, Conn.

The Dow Chemical Co.
Magnesium Sales Department
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Fairmont Aluminum Company
Fairmont, West Virginia

International Selling Corp.
220 E. 42nd St.
New York 17, N. Y.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

LaPointe Industries Inc.
Rockville, Conn.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Olin Aluminum
400 Park Avenue
New York 22, N. Y.

Pfister Aluminum Corp.
50 West Allendale Ave.
Allendale, N. J.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Scovill Manufacturing Co.
99 Mill Street
Waterbury, Connecticut

COILS, PRE-ANODIZED

Coil Anodizers, Inc.
1250 Keating Ave.
Muskegon, Mich.

Fairmont Aluminum Co.
Fairmont, West Virginia

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Rusmar Processing Co.
212 Northwest Highway
Fox River Grove, Ill.

COILS, PRE-PAINTED

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Enameled Steel & Sign Co.
4658 W. Addison St.
Chicago 41, Ill.

Fairmont Aluminum Co.
Fairmont, West Virginia

Pre Finish Metals Inc.
2110 E. Pratt Blvd.
Elk Grove, Ill.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Aluminum Supply Co.
573 W. Peachtree Street, N.E.
Atlanta, Georgia

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Seaway Products
Div'n Globe Industries Inc.
2207 Schrage Ave.
Whiting, Ind.

Zegers, Inc.
8090 So. Chicago Ave.
Chicago 17, Ill.

COMPOUNDS, BARREL FINISHING

Allied Research Products, Inc.
4004 East Monument St.
Baltimore 5, Md.

Oakite Products, Inc.
50A Rector St.
New York 6, New York

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

CONVERSION COATING, ALUMINUM

Allied Research Products, Inc.
4004 E. Monument St.
Baltimore 5, Md.

Amchem Products, Inc.
Ambler 12, Pa.

CONVERSION COATING (cont'd)

Conversion Chemical Corp.
99 E. Main St.
Rockville, Conn.

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

Heatbath Corp.
Springfield 1, Mass.

Neilson Chemical Co.
2318 Gainsboro
Detroit 20, Mich.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Parker Rust Proof Co.
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Detroit 11, Mich.

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Philadelphia 2, Pa.

CUTTING, GRINDING COMPOUNDS

Kerns United Corp.
2659 E. 95th St.
Chicago 17, Ill.

DIE STEELS FOR DIE CASTING

Ajax Steel & Forge Co.
205 Adair St.
Detroit 7, Mich.

Latrobe Steel Co.
Latrobe, Pa.

U.N. Alloy Steel Co.
365 Dorchester Ave.
Boston 27, Mass.

DIE STEEL, EXTRUSION

Ajax Steel & Forge Co.
205 Adair St.
Detroit 7, Mich.

Latrobe Steel Co.
Latrobe, Pa.

Marathon Specialty Steels, Inc.
375 Park Ave.
New York 22, N. Y.

U.N. Alloy Steel Co.
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Boston 27, Mass.

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Grafo Colloids Corp.
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

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Chicago, Ill.

Northwest Chemical Co.
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Detroit 4, Mich.

DYES, ANODIZING

Koppers, Inc.
Chemicals & Dyestuffs Div.
Porter Building
Pittsburgh 19, Pa.

ELECTRODES FOR WELDING

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

ENAMELS, PORCELAIN ALUMINUM

Ferro Corporation
4150 E. 56th St.
Cleveland 5, Ohio

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Ambler 12, Pa.

Frederick Gumm Chemical Co.
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Kearny, N. J.

Heatbath Corp.
Springfield 1, Mass.

Neilson Chemical Co.
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Detroit 20, Mich.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Oakite Products, Inc.
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New York 6, N. Y.

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Detroit 11, Mich.

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Three Penn Center
Philadelphia 2, Pa.

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Benson Aluminum Co., Inc.
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Connersville, Ind.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Jarl Extrusions, Inc.
Linden Road
East Rochester, N. Y.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Olin Aluminum
400 Park Avenue
New York 22, New York

Pfister Aluminum Corp.
50 West Allendale Ave.
Allendale, N. J.

Pittsburgh Aluminum Alloys Co.
Murrysville, Pa.

Precision Extrusions, Inc.
720 E. Green St.
Bensenville, Ill.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Southern Extrusions Co.
North Washington Street
Magnolia, Arkansas

Superior Industries, Inc.
3786 Oakwood Ave.
Youngstown, Ohio

Wells Aluminum Corp.
North Liberty, Ind.

Wolverine Tube Div.
Calumet & Hecla, Inc.
17262 Southfield Rd.
Allen Park, Mich.

EXTRUSIONS, IMPACT

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Connecticut

Harvey Aluminum
Torrance, Calif

EXTRUSIONS, IMPACT, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

EXTRUSIONS, MAGNESIUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Michigan

EXTRUSIONS, TITANIUM

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Connecticut

Harvey Aluminum
Torrance, Calif.

EXTRUSIONS, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

FASTENERS, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Southern Screw Company
Statesville, North Carolina

FENCING, ALUMINUM

Nichols Wire & Aluminum Co.
Davenport, Iowa

FINISHES AND COATINGS, ALUMINUM

Allied Research Products, Inc.
4004 East Monument St.
Baltimore 5, Md.

Alumi-gard Co.
1638 W. 79th St.
Chicago 20, Ill.

Amchem Products, Inc.
Ambler 12, Pennsylvania

Conversion Chemical Corp.
99 E. Main St.
Rockville, Conn.

De Soto Chemical Coatings, Inc.
1350 S. Kostner Ave.
Chicago 23, Ill.

Diversey Corp.
1820 Roscoe St.
Chicago 13, Ill.

Frederick Gumm Chemical Co.
538 Forest St.
Kearny, N. J.

Heatbath Corp.
Springfield 1, Mass.

Neilson Chemical Co.
2318 Gainsboro
Detroit 20, Mich.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Oakite Products, Inc.
50A Rector St.
New York 6, New York

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

Sherwin-Williams Co.
101 Prospect, N. W.
Cleveland 1, Ohio

Virginia-Carolina Chemical Corp.
401 E. Main St.
Richmond 8, Va.

FLUXES, MELTING

Alloys & Chemicals Corp.
4365 Bradley Road, S. W.
Cleveland 9, Ohio

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Apex Smelting Company
2537 West Taylor Street
Chicago 12, Illinois

Federated Metals Div.
American Smelting & Refining Corp.
120 Broadway
New York 5, N. Y.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

FLUX, SOLDERING, BRAZING WELDING

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

FOIL, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Anaconda Aluminum Co.
P.O. Box 1654
Louisville 1, Ky.

Consolidated Aluminum Corp.
Jackson, Tenn.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 West Broad St.
Richmond 18, Va.

FOIL, ALUMINUM, ANODIZED

Anodyne, Inc.
1270 N. W. 165th St.
North Miami Beach 69, Fla.

Coil Anodizers, Inc.
1250 Keating Ave.
Muskegon, Mich.

FORGINGS, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn. (Al, Ti

Chase Brass & Copper Co.
Waterbury 20, Conn.

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical
Kaiser Center
Oakland 12, Calif.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Scovill Manufacturing Co.
99 Mill St.
Waterbury, Conn.

Wyman-Gordon Company
Worcester 1, Mass. (Al, Mg

FORGINGS, EXTRUSION, TOOL

Ajax Steel & Forge Co.
205 Adair St.
Detroit 7, Mich.

Latrobe Steel Co.
Latrobe, Pa.

FORGINGS, IMPACT

Aluminum Company of Americ
877 Alcoa Building
Pittsburgh 19, Pa.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Harvey Aluminum
Torrance, Calif.

FORGINGS, MAGNESIUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Harvey Aluminum
Torrance, Calif.

Wyman-Gordon Company
Worcester 1, Mass.

FRIT, PORCELAIN ENAMEL

Ferro Corp.
4150 E. 56th St.
Cleveland 5, Ohio

GALLIUM

Aluminum Co. of America
Alcoa Bldg.
Pittsburgh 19, Pa.

A.I.A.G. Metals Inc.
9 Rockefeller Plaza
New York 20, N. Y.

HARDWARE, DOOR, WINDOW

Cipco Corporation
22nd & Cole Streets
St. Louis 6, Mo.

HEAT TREATING SALTS, ALUMINUM

Heatbath Corp.
Springfield 1, Mass.

HIGH PURITY ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Consolidated Aluminum Corp.
Jackson, Tenn.

Kaiser Aluminum & Chemical Cor
Kaiser Center
Oakland 12, Calif.

INGOT, ALUMINUM (ALLOYS)

Alloys & Chemicals Corp.
4365 Bradley Road, S. W.
Cleveland 9, Ohio

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum & Magnesium, Inc.
Sandusky, Ohio

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

m Transatlantic, Inc.
kefeller Plaza
ork 20, N. Y.

la Aluminum Co.
Box 1654
ille 1, Ky.

nelting Company
West Taylor Street
go 12, Illinois

d Metals Div.
roadway
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Aluminum
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ional Selling Corp.
. 42nd St.
York 17, N. Y.

Aluminum & Chemical Sales
Center
nd 12, Calif.

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rk Ave.
ork 22, N. Y.

Copper & Brass, Inc.
rk Ave.
ork 17, N. Y.

s Metals Company
W. Broad St.
ond 18, Va.

MAGNESIUM (ALLOYS)

nelting Company
West Taylor Street
go 12, Illinois

n Magnesium Limited
ay St.
to, Ont.

w Chemical Co.
sium Sales Dept.
nd, Michigan

ZIRCONIUM

Aluminum
nce, Calif.

TION PIPE, ALUMINUM

m Co. of America
lcoa Building
rgh 19, Pa.

Extrusions, Inc.
Lake Park Road
stown, Ohio

Aluminum
nce, Calif.

rusions, Inc.
n Road
Rochester, N. Y.

Aluminum & Chemical Sales
Center
nd 12, Calif.

minum
rk Ave.
ork 22, N. Y.

gh Aluminum Alloys Co.
sville, Pa.

Extrusions, Inc.
. Green Ave.
nville, Ill.

s Metals Company
W. Broad St.
ond 18, Va.

ANTS:
DING, CASTING, FORMING

Colloids Co.
Acheson Industries, Inc.
Huron, Mich.

olloids Corp.
Wilkes Place
n, Pa.

e Products Corp.
field, Ohio

dson Corp.
1 W. 66th St.
go 38, Ill.

Jnited Corp.
E. 95th St.
go, Ill.

Products, Inc.
ector St.
York 6, New York

Rust Proof Co.
E. Milwaukee Ave.
t 11, Mich.

Chemicals Corp.
Penn Center
lelphia 2, Pa.

emical Corp.
. Garfield
ale 4, Calif.

MAINTENANCE MATERIALS, PAINT SPRAY BOOTH

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

NAILS, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

NAME PLATES, ANODIZED

Anodyne, Inc.
1270 N. W. 165th St.
North Miami Beach 69, Fla.

NUTS

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

PANELS, ANODIZED

Anodyne, Inc.
1270 N. W. 165th St.
North Miami Beach 69, Fla.

PIPE, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Connecticut

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Michigan

Harvey Aluminum
Torrance, Calif.

Jarl Extrusions, Inc.
Linden Road
East Rochester, N. Y.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Pittsburgh Aluminum Alloys Co.
Murrysville, Pa.

Precision Extrusions, Inc.
720 E. Green St.
Bensenville, Ill.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Wells Aluminum Corp.
North Liberty, Ind.

Wolverine Tube Div.
Calumet & Hecla, Inc.
17262 Southfield Rd.
Allen Park, Mich.

PLASTIC CAPS, INSERTS

Impex Corp.
4049 Simon Road
Youngstown 12, Ohio

PLASTIC, RESIN

Union Carbide Plastics Div'n
270 Park Ave.
New York 17, N. Y.

PLATE, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

The Dow Metal Products Co.
Div'n, The Dow Chemical Co.
Midland, Mich.

Fairmont Aluminum Company
Fairmont, West Virginia

International Selling Corp.
220 E. 42nd St.
New York 17, N. Y.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Nichols Wire & Aluminum Co.
Rockingham Road
Davenport, Iowa

Olin Aluminum
400 Park Avenue
New York 22, New York

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

PLATE, MAGNESIUM

Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Michigan

PLATE, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

POLISHING, BUFFING COMPOUNDS

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

POLISHING, CHEMICAL

Alchemize Corporation
621 South Kolmar
Chicago 24, Illinois

Allied Research Products, Inc.
4004 East Monument St.
Baltimore 5, Md.

Conversion Chemical Corp.
99 E. Main St.
Rockville, Conn.

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

Heatbath Corp.
Springfield 1, Mass.

Virginia-Carolina Chemical Corp.
431 E. Main St.
Richmond 8, Va.

REFRACTORY PRODUCTS

Babcock & Wilcox Corp.
Refractories Div.
161 E. 42nd Street
New York 17, N. Y.

Harbison-Walker Refractories Co.
Farmers Bank Building
Pittsburgh 22, Pa.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

H. K. Porter Co., Inc.
Porter Bldg.
Pittsburgh 19, Pa.

Refractory Products Co.
910 Custer Ave.
Evanston, Ill.

RIVETS, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

ROD AND BAR, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

ROD, BRAZING

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Nichols Wire & Aluminum Co.
Davenport, Iowa

ROD, WELDING

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminum Company of America
877 Alcoa Buildings
Pittsburgh 19, Pennsylvania

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

ROLLING OILS

Kerns United Corp.
2659 E. 95th St.
Chicago 17, Ill.

SCREEN WIRE, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

SCREWS, MACHINE, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Southern Screw Company
Statesville, North Carolina

SCREWS, TAPPING, ALUMINUM

Southern Screw Company
Statesville, North Carolina

SCREWS, WOOD, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Southern Screw Company
Statesville, North Carolina

SHAPES, ROLL FORMED

Nichols Wire & Aluminum Company
Davenport, Iowa

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

Pfister Aluminum Corp.
50 West Allendale Ave.
Allendale, N. J.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

SHEET, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Mills, Inc.
1660 Deerfield Road
Highland Park, Ill.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn.

Consolidated Aluminum Corp.
Jackson, Tenn.

The Dow Metal Products Co.
Div'n, The Dow Chemical Co.
Midland, Mich.

Fairmont Aluminum Company
Fairmont, West Virginia

International Selling Corp.
220 E. 42nd St.
New York 17, N. Y.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Olin Aluminum
400 Park Avenue
New York 22, New York

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Scovill Manufacturing Co.
99 Mill Street
Waterbury, Conn.

SHEET, ANODIZED

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

SHEET, ANODIZED (CONT'D)

City Plating & Polishing Co.
22nd & Cole Street
St. Louis 6, Missouri

Coil Anodizers, Inc.
1250 Keating Ave.
Muskegon, Mich.

Fairmont Aluminum Co.
Fairmont, West Virginia

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Southern Extrusions, Inc.
North Washington Street
Magnolia, Arkansas

SHEET, MAGNESIUM

Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

SHEET, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

SOLDER, ALUMINUM

All-State Welding Alloys Co., Inc.
249-55 Ferris Ave.
White Plains, N. Y.

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

Production Metals, Inc.
299 Pavonia Ave.
Jersey City 2, N. J.

STRIPPERS, METAL & PAINT

Allied Research Products, Inc.
4004 East Monument St.
Baltimore 5, Md.

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

Heatbath Corp.
Springfield 1, Mass.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

THORIUM METAL

Dominion Magnesium Limited
320 Bay St.
Toronto, Ont.

TOOLING PLATE, ALUMINUM

Reynolds Metals Co.
6601 W. Broad St.
Richmond 18, Va.

TOOLING PLATE, MAGNESIUM

The Dow Metal Products Co.
Div'n, The Dow Chemical Co.
Midland, Mich.

TREAD PLATE, MAGNESIUM

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

TUBED SHEET, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Olin Roll-Bond Division
East Alton, Ill.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Co.
6601 W. Broad St.
Richmond 18, Va.

TUBE, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn.

The Dow Metal Products Co.
Div'n, Dow Chemical Co.
Midland, Mich.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Jarl Extrusions, Inc.
Linden Road
East Rochester, N. Y.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

LaPointe Industries Inc.
Rockville, Conn.

Olin Aluminum
400 Park Avenue
New York 22, New York

Pfister Aluminum Corp.
50 West Allendale Ave.
Allendale, N. J.

Pittsburgh Aluminum Alloys Co.
Murrysville, Pa.

Precision Extrusions, Inc.
720 E. Green Ave.
Bensenville, Ill.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Saramar Aluminum Co.
4021 Mahoning Ave.
Youngstown, Ohio

Southern Extrusions Company
North Washington Street
Magnolia, Arkansas

Wells Aluminum Corp.
North Liberty, Ind.

Wolverine Tube Div.
Calumet & Hecla, Inc.
17262 Southfield Rd.
Allen Park, Mich.

TUBE BENDING COMPOUNDS

Kerns United Corp.
2659 E. 95th St.
Chicago 17, Ill.

TUBE, MAGNESIUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

The Dow Metal Products Co.
Div. Dow Chemical Co.
Midland, Mich.

TUBE, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

Wolverine Tube
Div. Calumet & Hecla Inc.
17200 Southfield Rd.
Allen Park, Mich.

VENETIAN BLIND STOCK

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

VINYL RESINS

Union Carbide Plastics Div'n
270 Park Ave.
New York 17, N. Y.

WIRE, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

WIRE, PRECISION SPOOLED, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Ave.
White Plains, N. Y.

WIRE DRAWING COMPOUNDS

Grafo Colloids Corp.
Sharon, Pa.

Kerns United Corp.
2659 E. 95th St.
Chicago, Ill.

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

EQUIPMENT

ALLOY TESTING INSTRUMENTS

Schuco Scientific Div'n
Schueler & Co.
75 Cliff St.
New York 38, N. Y.

ANODIZING EQUIPMENT

The Gilbert Tramer Co
1217 Main
Cleveland, Ohio

BARREL FINISHING EQUIPMENT

Allied Research Products Inc.
4004 E. Monument St.
Baltimore 5, Md.

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

BEARINGS

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

Morgan Construction Co.
Worcester, Mass.

BILLET CUTTERS

Loma Machine Manufacturing
114 East 32nd Street
New York 16, New York

Stone Machinery Co., Inc.
Manlius, New York

BILLET HEATERS

Ajax-Magnethermic Corp.
3990 Simon Road
Youngstown 7, Ohio

Granco, Inc.
317 32nd St., S.W.
Grand Rapids 8, Mich.

Hevi-Duty Electric Co.
Div. Basic Products Corp.
3002 W. Burleigh St.
Milwaukee, Wis.

The Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio

Lindberg Engineering Co.
2446 W. Hubbard St.
Chicago 12, Ill.

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Morrison Engineering Corp.
P. O. Box 4345
Cleveland 32, Ohio

W. S. Rockwell Co., Inc.
2060 Eliot Street
Fairfield, Conn.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

Warwick Industrial Furnace & Engineering Corp.
452 W. Chicago Ave.
Chicago 10, Ill.

BUFFING & POLISHING EQUIPMENT

Hammond Machinery Builders
1600 Douglas Ave.
Kalamazoo, Michigan

The Gilbert Tramer Co.
1217 Main Ave.
Cleveland 13, Ohio

BURNERS, OIL, GAS

E. W. Bliss Company
Canton 10, Ohio

CASTING EQUIPMENT, BILLE

Lobeck Casting Processes Inc.
114 E. 32nd St.
New York 16, N. Y.

Morrison Engineering Corp.
P. O. Box 4345
Cleveland 32, Ohio

Permanent Mold Die Co., Inc
2275 E. Nine Mile Road
Hazel Park, Mich.

CASTING MACHINES CONTINUOUS

Lobeck Casting Processes Inc.
114 E. 32nd St.
New York 16, N. Y.

COATING THICKNESS TESTER

Unit Process Assemblies, Inc.
53-15 37th Ave.
Woodside 77, New York, N. Y

COIL COATING LINES

Gasway Corp.
6463 N. Ravenswood Ave.
Chicago 26, Ill.

COLD DRAW EQUIPMENT

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

COLD DRAWING MACHINE, CONTINUOUS

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

CUTTING MACHINES, WIRE

Mettler Machine Tool Inc.
155 Adeline St.
New Haven, Conn.

DISTRIBUTORS AND JOBBERS

These firms warehouse most forms of aluminum—sheet, coil, rod, tube, extrusions, etc.—and are located in all major industrial areas.

Aluminum Mill Supply Corp.
42-44 Court Street
Brooklyn 1, N. Y.

Aluminum Transatlantic, Inc.
30 Rockefeller Plaza
New York 20, N. Y.

Atlantic Aluminum & Metal Distributors, Inc.
Page Boulevard
Springfield, Massachusetts

A. M. Castle & Co.
3400 N. Wolf Road
Franklin Park, Ill.

Chase Brass & Copper Co.
Waterbury 20, Conn.

Copper & Brass Sales, Inc.
6555 E. Davison
Detroit 12, Mich.

Peter A. Frasse and Company
17 Grand Street
New York, N. Y.

E. M. Jorgensen Company
10650 South Alameda
Los Angeles, California

Kilsby-Tubesupply
2501 S. Malt Ave.
Los Angeles 22, Calif.

A. B. Murray Co., Inc.
P. O. Box 476
Elizabeth, N. J.

Precision Steel Warehouse, Inc.
3500 North Wolf Road
Franklin Park, Illinois

Production Metals, Inc.
299 Pavonia Ave.
Jersey City 2, N. J.

Reynolds Aluminum Supply Co.
573 W. Peachtree Street, N.E.
Atlanta, Georgia

F MACHINES

n Roller Die Corp.
Clayton Avenue
iffe, Ohio

lachine Mfg. Co., Inc.
. 32nd St.
York 16, N. Y.

n Roll Form, Inc.
Hubbell
it 28, Mich.

Machinery Company
ixth Street, N.W.
l Rapids 2, Michigan

Cut Abrasive Machine Div'n
r Pipe Tools, Inc.
en, Ohio

der Company
Walworth Ave.
land 2, Ohio

STING MACHINES

Engineering Co.
Empire Building
burgh 22, Pa.

Hydropress
Baldwin-Lima-Hamilton
Fifth Avenue
York 3, New York

Machine Mfg. Co., Inc.
2. 32nd St.
York 16, N. Y.

Engineering Co.
National Bank Bldg.
burgh 22, Pa.

-Stillman Press Div.
l-Birmingham Co., Inc.
Blossom Road
ester 10, N. Y.

STING MACHINES

Cast Corp.
Basic Products Corp.
West Burleigh
aukee 1, Wisconsin

Machinery Co.
Greenlee Bros. & Co.
W. Eighth St.
and, Mich.

Hydropress
Baldwin-Lima-Hamilton
Fifth Avenue
York 3, New York

EATERS

uty Electric Co.
Basic Products Corp.
W. Burleigh St.
aukee, Wis.

arl Mayer Corp.
0 Center Ridge Rd.
eland 16, Ohio

anly Co.
Euclid Ave.
eland 15, Ohio

DIE CASTING

nent Mold Die Co., Inc.
E. Nine Mile Road
el Park, Mich.

EXTRUSION

Tool & Die Works
Grinnell Avenue
oit 13, Michigan

Extrusion Die Co.
Beebe Ave.
ren, Mich.

NOTCHING

gan Roll Form, Inc.
Hubbell
oit 28, Mich.

PERMANENT MOLD

nent Mold Die Co., Inc.
E. 9-Mile Rd.
el Park, Mich.

BOARDS, MAGNESIUM

& Perkins, Inc.
W. Fort St.
oit 16, Mich.

BENCHES

can Laubscher Corp.
W. 57th St.
York 19, N. Y.

-Hydropress
Baldwin-Lima-Hamilton
Fifth Avenue
York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

DRYERS, STRIP & SHEET, CONTINUOUS

W. S. Rockwell Co., Inc.
2060 Eliot Street
Fairfield, Conn.

ELECTROPLATING EQUIPMENT

Allied Research Products Inc.
4004 E. Monument St.
Baltimore 5, Md.

The Gilbert Tramer Co.
1217 Main Ave.
Cleveland 13, Ohio

EXTRUSION COILERS

Feller Engineering Co.
1159 Empire Building
Pittsburgh 22, Pa.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

EXTRUSION PRESS TOOLS

Ajax Steel & Forge Co.
205 Adair St.
Detroit 7, Mich.

Marathon Specialty Steels, Inc.
375 Park Ave.
New York 22, N. Y.

FILMS, X-RAY

Eastman Kodak Company
X-Ray Division
343 State Street
Rochester 4, New York

FOIL MILLS

E. W. Bliss Company
Salem, Ohio

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

United Engineering & Foundry Co
Pittsburgh 22, Pennsylvania

FURNACE CONTROL EQUIPMENT

Morgan Construction Co.
Worcester, Mass.

FURNACES, ANNEALING

Lee-Wilson Engineering Co.
20005 Lake Rd.
Cleveland 16, Ohio

Sunbeam Equipment Corp.
196 Mercer St.
Meadville, Pa.

FURNACES, BRAZING

Lindberg Engineering Co.
2446 W. Hubbard
Chicago, Ill.

Sunbeam Equipment Corp.
196 Mercer St.
Meadville, Pa.

FURNACES, HEAT TREATING

Ajax-Magnethermic Corp.
3990 Simon Road
Youngstown 7, Ohio

Hevi-Duty Electric Co.
Div. Basic Products Corp
3002 W. Burleigh St.
Milwaukee, Wis.

The Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio

Lee-Wilson Engineering Co.
20005 Lake Rd.
Cleveland 16, Ohio

Lindberg Engineering Co.
2446 W. Hubbard
Chicago, Illinois

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Morrison Engineering Corp.
P. O. Box 4345
Cleveland 32, Ohio

W. S. Rockwell Co., Inc.
2060 Eliot Street
Fairfield, Conn.

Sunbeam Equipment Corp.
196 Mercer St.
Meadville, Pa.

Swindell-Dressler Corp.
P. O. Box 1888
Pittsburgh, Pa.

Warwick Industrial Furnace & Engineering Corp.
452 W. Chicago Ave.
Chicago 10, Ill.

FURNACES, MELTING

Ajax Engineering Div.
Ajax-Magnethermic Corp.
P. O. Box 1418
Trenton 7, N. J.

Hevi-Duty Electric Co.
Div. Basic Products Corp
3002 W. Burleigh St.
Milwaukee, Wis.

Lindberg Engineering Co.
2446 W. Hubbard
Chicago, Ill.

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Morrison Engineering Corp.
P. O. Box 4345
Cleveland 32, Ohio

W. S. Rockwell Co., Inc.
2060 Eliot Street
Fairfield, Conn.

Sunbeam Equipment Corp.
196 Mercer St.
Meadville, Pa.

Swindell-Dressler Corp.
P. O. Box 1888
Pittsburgh, Pa.

Warwick Industrial Furnace & Engineering Corp.
452 W. Chicago Ave.
Chicago 10, Ill.

GENERATORS, GAS ATMOSPHERE

Hevi-Duty Electric Co.
Div. Basic Products Corp.
3002 W. Burleigh St.
Milwaukee, Wis.

Lindberg Engineering Co.
2446 W. Hubbard St.
Chicago 12, Ill.

Sunbeam Equipment Corp.
196 Mercer St.
Meadville, Pa.

GRINDERS, BELT

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

GRINDERS, DISC

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

GRINDER — POLISHER

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

INSPECTION KITS

Magnaflux Corp.
7300 W. Lawrence Ave.
Chicago 31, Ill.

LEVELERS—ROLLER & STRETCHER

The Aetna-Standard Div.
Blaw-Knox Co.
Frick Building
Pittsburgh 30, Pa.

E. W. Bliss Company
Salem, Ohio

Hyde Park Foundry & Machine Co.
Hyde Park
Westmoreland County, Pa.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Stanat Manufacturing Company, Inc.
500 Shames Dr.
Westbury, N. Y.

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

United Engineering & Foundry Co.
Pittsburgh 22, Pennsylvania

Voss Engineering Co.
7301 Penn Ave.
Pittsburgh 8, Pa.

F. A. Woehr Machine Co.
17 Favor St.
Rochester, N. Y.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

MILLING MACHINES

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

MOLDS, INGOT

Lobeck Casting Processes Inc.
114 E. 32nd St.
New York 16, N. Y.

OVENS, AGING

Hevi-Duty Electric Co.
Div. Basic Products Corp.
3002 W. Burleigh St.
Milwaukee, Wis.

The Lanly Co.
2800 Euclid Ave.
Cleveland 15, Ohio

The Carl Mayer Corp.
20800 Center Ridge Rd.
Cleveland 16, Ohio

Lindberg Engineering Co.
2446 W. Hubbard St.
Chicago 12, Ill.

Morrison Engineering Corp.
P. O. Box 4345
Cleveland 32, Ohio

W. S. Rockwell Co., Inc.
2060 Eliot Street
Fairfield, Conn.

Sunbeam Equipment Corp.
196 Mercer St.
Meadville, Pa.

PISTON CORES

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

PLATING EQUIPMENT

Allied Research Products Inc.
4004 E. Monument St.
Baltimore 5, Md.

PRESSES, DRAWING, FORMING, STAMPING, ETC.

E. W. Bliss Co.
1375 Raff Road, S.W
Canton, Ohio

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

PRESSES, EXTRUSION

E. W. Bliss Co.
1375 Raff Road, S.W.
Canton, Ohio

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

PRESSES, FORGING

E. W. Bliss Co.
1375 Raff Road, S.W.
Canton, Ohio

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Lake Erie Machinery Corp.
883 Woodward Ave.
Buffalo 17, N .Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

FORGING PRESSES (cont'd)

United Engineering & Foundry Co.
Pittsburgh 22, Pa.

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

PRESSES, IMPACT EXTRUSION

F. Herlan Machinery Corp.
104 E. 40th Street
New York 16, N. Y.

E. W. Bliss Co.
1375 Raff Road S. W.
Canton, Ohio

RACKS, ANODIZING

Servi-Sure Mfg. Co.
131 N. Green St.
Chicago 7, Illinois

RECTIFIERS—GERMANIUM & SELENIUM

Allied Research Products Inc.
4004 E. Monument St.
Baltimore 5, Md.

The Gilbert Tramer Co.
1217 Main Ave.
Cleveland 13, Ohio

REELS, PAY-OFF

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

Mettler Machine Tool Inc.
155 Adeline St.
New Haven, Conn.

F. A. Woehr Machine Co.
17 Favor St.
Rochester, N. Y.

ROLL FORMING EQUIPMENT

American Roller Die Corp.
29510 Clayton Avenue
Wickliffe, Ohio

Arnold Metals & Machinery, Inc.
596 River Road
Clifton, New Jersey

Craver Industries, Inc.
Craver Indust'l Park
Charleston, S. C.

Flexolite Mfg. Corp.
1887 State St.
Schenectady 4, N. Y.

The Lockformer Co.
4617 W. Roosevelt Rd.
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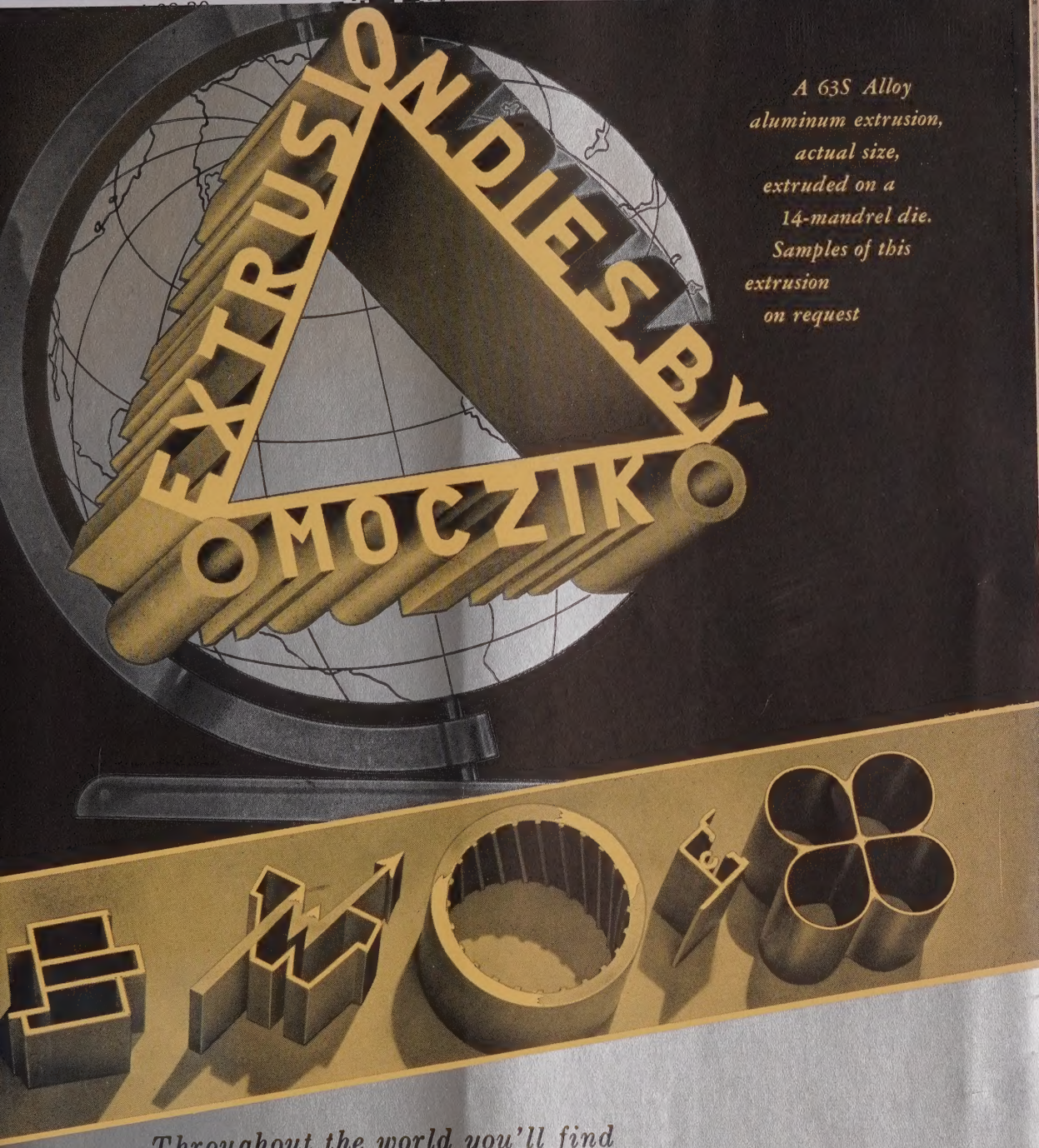

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IN THE U. S. A. AND CANADA

Looking Ahead

Rebuilding of existing structures, an important market for aluminum siding and window outfits, is quickly entering phase two. It now merits attention of big builders, architects and money lenders. One reason: New construction has hit a peak, and may remain static or slip slightly for several years. Another reason: There simply isn't enough money to finance replacement of all the older buildings in our cities. Architects and engineers are now becoming slightly aware that rebuilding can not only be economical for the owner, but that they can make money in the work. They also realize that a technology of rebuilding is virtually non-existent. Reminds us of the problems aluminum faced in the late '40's, when architects were confronted with a new material about which they knew nothing.

Time for the aluminum industry to speak up is now —before the pattern of this redesigning and rebuilding is standardized. It's already a big business—over $15 billion annually—but the skygazers say it will hit $25 billion in two years. But to succeed, the whole picture—esthetic, technical and economic—must be developed in harmony with new construction. The rebuilding kick is now taken seriously by the big architectural magazines; they, too, see the handwriting on the wall. All of which will move it along faster because these books influence thinking in Washington. Look for new legislation and encouragement to come from the federal government. This can be a great outlet for aluminum—if the industry gets behind the move at this blueprint stage.

Tariffs: Up or down? While importers and some users are petitioning for lower tariffs on primary aluminum, the producers naturally want more protection. We can't see either side gaining any ground. Best way to lick the import-export problem is to start a college for union organizers. Have professors Reuther, McDonald and Lewis run the school and send 200 to 300 graduates throughout the world to organize labor; bring wage scales in other countries up to ours. Think of all the appliances, television sets, and other durables that could be sold abroad if laborers throughout the world had take-home pay of $100 or more per week!

Awning manufacturers got a big boost this month when Bridgeport Brass uncorked monster ads in LIFE, aimed at the homeowner. This costs big money, but it has great impact; will sell aluminum awnings, halt inroads by other materials. Awning manufacturers should appreciate what Bridgeport Brass is doing for them.

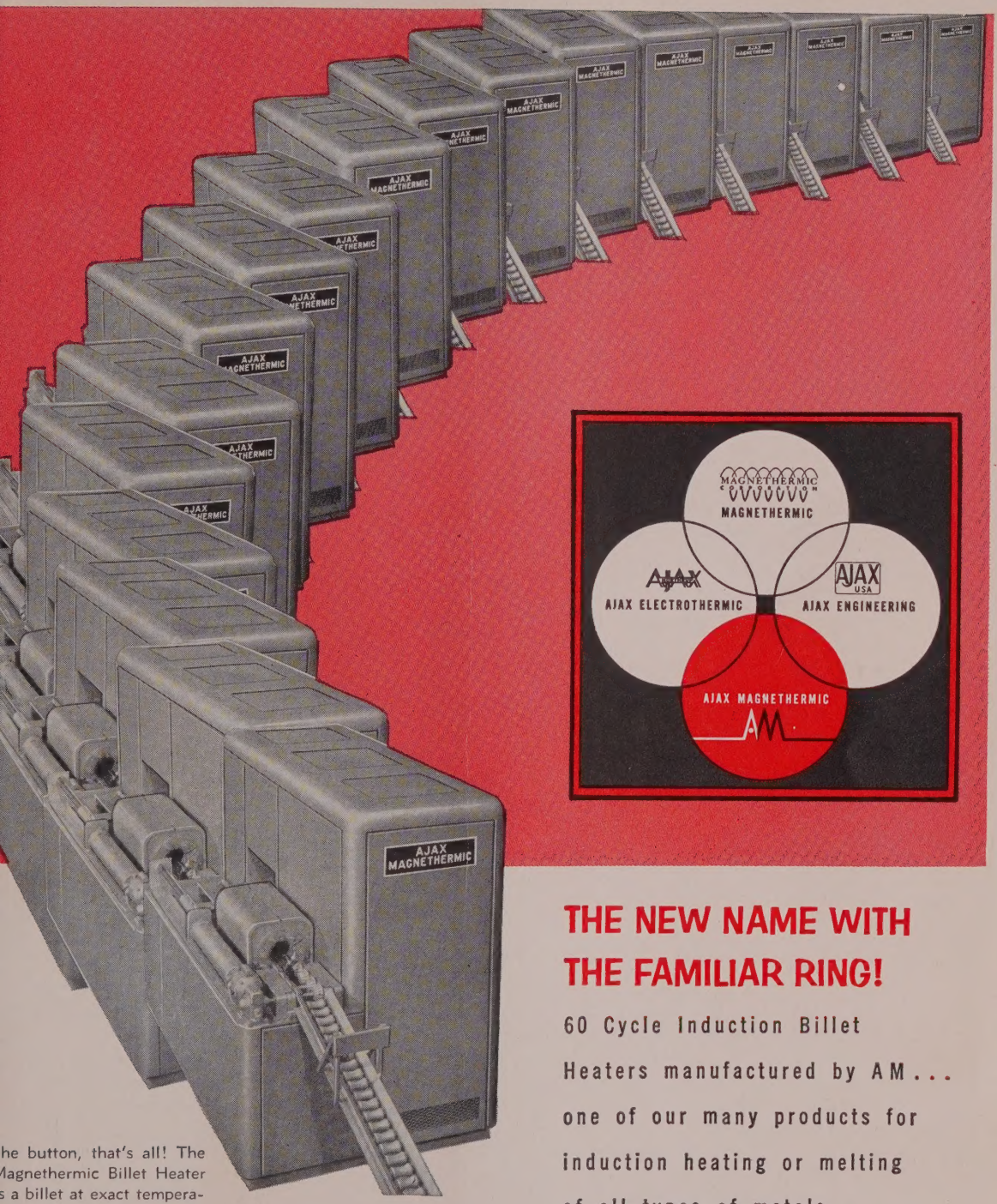
Aluminum screen cloth will get its turn next mo when the aluminum producers, Amchem P ucts, and the aluminum screen manufactu put on massive promotions in the mass m zines, television and major trade shows. since the plastic boys cut prices last year competition has gotten rougher. But it sho the 20-odd aluminum screen outfits and t suppliers into action. Result: It's banding th together against the common enemy. This may be a good one all the way. This sure b sitting and hoping.

What's with aluminum in the '62 cars? Lots of con versy in Detroit. It almost looks as though makers are starting to play games with alu num and gray iron producers (just as conta firms are doing with tinplate and aluminu While auto materials experts growl about chining and leakage problems with alumi (particularly die castings), they concede that the small engines aluminum's weight sa gives it the edge. They concede that for four-cylinder jobs (for which interest is gr ing), the aluminum engine makes for gre gas economy. Chrysler's Lancer now has an tional six-cylinder engine with an alumi block, die cast on some new machines at Ko mo, Ind. Chrysler says it cuts the engine we by about 65 pounds; may start pushing alu num harder if this job works well.

Users of aluminum can look forward to bargain pr through most of 1961. Forces that have depre prices are still at work. These include ex capacity, mounting inventories, sluggish dem in key markets and stiff competition from m materials. Chief result is price-cutting that p trates into the critical mill products level, h ing independent producers of aluminum sh extrusions, tube, rod and the like, as well the primary producers.

Major changes in world magnesium production markets are underway. Norway's governmi controlled magnesium industry moved into German market last year (by undercutting minion Magnesium of Toronto) and sold Vo wagen a major part of that auto maker's ne Dominion Magnesium made up some of loss by selling Red China about $2 million wo of the metal; increased its sales to the Un Kingdom and U.S.A. by over $400,000, and st ed this year with sales so brisk that volume be best in many a year. Germany, the lar per-capita user anywhere, chewed up nearly 000 tons—most of it for the Volkswagen. many has not produced magnesium since end of the war; hopes to produce 7000 tons nually in the former Bitterfeld plant by 19 plans to double the plant's capacity.

—The Edi



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